TECHNICAL REVIEW COMMENTS ON THE PROPOSED PLAN FOR SKINNER LANDFILL

Prepared for:

Skinner Landfill PRP Group

September 21, 1992

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Dear Ladies/Gentlemen:

Re: Skinner Landfill

Enclosed is the technical review comments on the EPA RI/FS and health risk assessment reports prepared by Dunn Corporation on behalf of the Skinner Landfill PRP Group.

Very truly yours,

Beji Malek
Chairperson, Technical Committee
Skinner Landfill PRP Group

BM:get

Enclosure

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TECHNICAL REVIEW COMMENTS
ON THE REMEDIAL INVESTIGATION, BASELINE RISK ASSESSMENT, FEASIBILITY STUDY AND PROPOSED PLAN FOR SKINNER LANDFILL
UNION TOWNSHIP OF BUTLER COUNTY, OHIO

Prepared for:

Skinner Landfill PRP Group

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September 21, 1992

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The data obtained by USEPA during the Remedial Investigation do not support the conclusion that the buried lagoon and active landfill are significant sources of actively migrating chemical constituents. Groundwater data from the site show that the extent of contamination emanating from the buried lagoon and landfill areas is limited to the immediate vicinity of the lagoon, even after more than 15 years of uncontrolled infiltration of precipitation through these materials without any engineered controls to limit potential pollutant migration. The soil boring data obtained by drilling through the buried lagoon materials can not be relied upon to establish the extent of subsurface impacts because of 1) possible carry-down of contamination during the collection of samples due to the sticky nature of the waste materials, and 2) the inappropriate combination of soil vapor data measured with three different instruments.

The degree of human health risk posed by the site under existing site conditions has been overstated in the USEPA Baseline Risk Assessment. Carcinogenic risks exceeding one new case of cancer among a population of 100 individuals similarly exposed over their lifetime (10^{-2}) were calculated for situations involving direct exposure (dermal absorption and/or ingestion) to on-site soils. However, this calculation used both improper data and improper methods. The Baseline Risk Assessment improperly included data from a soil sample now buried by four to eight feet of debris among the data used to calculate risks from direct contact with on-site soils. The Baseline Risk Assessment improperly assumed a residential rather than recreational exposure pathway for direct contact with surface soils located more than 1000 feet from the nearest permanent residence. Finally, the Baseline Risk Assessment failed to include average-case risk conditions which would have shown baseline human health risks to be within the acceptable risk range (i.e., less than 10^{-4}). The net effect of these instances of improper methodology in the Baseline Risk Assessment is that current and future risks potentially posed by the site are overstated. Because these overstated risks were then used to develop the general response actions and to evaluate remedial alternatives in the Feasibility Study, the level of appropriate remedial action has also been overstated.

The USEPA has established guidelines pertaining to the remediation of CERCLA landfills through the NCP and other CERCLA guidance documents. These guidelines identify landfills as the type of site where treatment may be impracticable due to the size and heterogeneity of the landfill waste. Nevertheless, the Feasibility Study justified the selection of an incineration alternative on the basis that the buried lagoon materials constitute a "hot spot" as described in the CERCLA landfill guidance and a "principal threat" as described in the NCP. These characterizations of the site are not supported by the data obtained during the RI/FS.

II. In selecting the preferred remedial alternative, the Proposed Plan did not consider all of the nine evaluation criteria established by the NCP appropriately.

According to the Proposed Plan, all of USEPA's remedial alternatives are expected to be protective of human health and the environment in the long term. In addition, the Proposed Plan states that 1) they all meet chemical-specific ARARs to the same degree, 2) with one possible exception they all meet action-specific ARARs, and 3) they all meet location-specific ARARs. However, this conclusion overlooks the fact that on-site incineration can not meet the location-specific ARAR of the State of Ohio's hazardous waste facility siting requirements. Section 3734.05(D)(6)(g)(i) of the Ohio Solid and Hazardous Waste Disposal Law states that *"[t]he [hazardous waste facility] board shall not approve an application for a hazardous waste facility installation and operation permit unless it finds and determines that: ... the active areas within the new hazardous waste facility ... are not located or operated within ... [t]wo thousand feet of any residence, school, hospital, jail or prison"*. This requirement can not be met at the Skinner site.

The Proposed Plan also states that all of the USEPA alternatives meet the objective of reducing contaminant mobility, toxicity, and volume through treatment with respect to groundwater, but that incineration alternatives are more effective because they provide additional treatment of the buried lagoon soils. However, this conclusion overlooks the following facts: 1) incineration would actually increase the amount of waste materials disposed on the site because there would be no volume reduction during burning, and because stabilization of the ash would require the addition of material to the waste; and 2) capping (although it is not treatment) minimizes percolation and thus reduces the movement of contaminants to the groundwater, thereby reducing the volume of potentially impacted groundwater and reducing its potential toxicity.

The Proposed Plan acknowledges that the incineration alternatives are less protective of human health and the environment in the short-term; however, the magnitude and significance of the additional risks involved were not fully assessed. In addition, the Proposed Plan erred in concluding that incineration is more effective in the long-term and more permanent than containment. This is not the case because 1) the proposed caps are capable of resisting erosion for approximately 8,300 years even if they are not maintained, and 2) the incineration alternatives involve landfilling of the residual ash which means that re-evaluation of the site will still be required every five years.

The Proposed Plan also incorrectly concluded that all alternatives were equally implementable because it failed to fully consider that the technical requirements for designing, permitting and operating an incinerator have significantly greater complexity than those for containment. Furthermore, because 1) all of USEPA's alternatives meet the requirements of the NCP and 2) incineration is no more permanent than containment, cost-effectiveness should have been considered. If USEPA's containment alternatives did not sufficiently meet the objective of treating on-site soils, a less costly alternative that combined containment with limited treatment of impacted soils should have been developed and evaluated as part of the Feasibility Study. (See Section 4 of this document.) Finally, it is clear from the comments made at the two public meetings that there are strong community objections to on-site incineration, and that capping has greater community acceptance.

III. Incineration is an inappropriate remedy because the risks posed by excavation have been understated or ignored.

In addition to organic and inorganic chemicals, nerve gas, mustard gas, incendiary bombs, phosphorus, flame throwers, cyanide ash, and explosive devices were reportedly buried at the site, and there may be methane gas and biohazards (i.e., pathogenic microbial agents) present in the landfill. Excavation of the buried lagoon will necessarily 1) create new pathways for exposure of the public (e.g., airborne emissions); 2) increase the significance of potential migration pathways (e.g., run-off from and enhanced percolation of rain-water through the excavation); and 3) involve the potential hazards of explosivity, flammability, combustibility, infectious diseases, chemical toxicity, nuisance odors, and fugitive dust generation. The Proposed Plan did not fully consider all of these potential risks, or their potential additive effects, in its selection of a preferred remedial alternative. In addition, the Proposed Plan did not consider the potential for these risks to be prolonged because of unexpected materials handling problems or other operational delays.

IV. An appropriate remedy (which combines features of several USEPA alternatives) would consist of the following elements: 1) a cap over the buried lagoon and active landfill areas; 2) soil vapor extraction in the soils beneath the buried lagoon, if feasible; 3) groundwater collection and treatment at the downgradient side of the potential source areas, if necessary; and 4) institutional controls (fencing, deed restrictions, and extension of public water supply).

This remedy is more appropriate because it is more protective of human health than incineration (because it avoids the substantial potential short-term risks posed by excavation of the buried lagoon); meets chemical- and action-specific ARARs to the same degree as incineration; meets location-specific ARARs to a greater degree than incineration; is as effective in the long-term and as permanent as incineration; reduces contaminant mobility, toxicity, and volume through treatment of soil and groundwater (if necessary) to a greater degree than containment alone; is more effective in the short-term than incineration; is more readily implemented than incineration; is less costly than incineration; and (based on comments made during the May 20, 1992 and July 29, 1992 public meetings) is likely to have greater public acceptance than incineration.

1.0 INTRODUCTION

1.1 Purpose

This report presents the results of a technical evaluation performed by Dunn Corporation on behalf of the Skinner Landfill PRP Group. The report was prepared for presentation to USEPA as part of the Group's comments on USEPA's Phase I Remedial Investigation, Phase II Remedial Investigation, Baseline Risk Assessment, Feasibility Study and Proposed Plan for the Skinner Landfill Superfund Site. USEPA is required to evaluate and respond to public comments and, if appropriate, amend the Proposed Plan prior to issuance of a Record of Decision (ROD).

1.2 Approach

The technical evaluation presented in this report is based on a thorough review of the following USEPA documents:

- The Phase I Interim Remedial Investigation Report for Skinner Landfill Site, West Chester, Ohio, February 1989;

- The Phase II Remedial Investigation Report of the Skinner Landfill Site, West Chester, Ohio, May 1991;

- The Baseline Risk Assessment Report for the Skinner Landfill Site, West Chester, Ohio, Revised/Final, June 1991;

- The Feasibility Study Report for the Skinner Landfill Site, West Chester, Ohio, Finalized April 1992; and

- The Proposed Plan for the Skinner Landfill Site, West Chester, Ohio, issued April 1992.

These reports were examined and compared with the National Contingency Plan (NCP) and applicable USEPA regulatory guidance documents. This examination also addressed the questions of whether good scientific and engineering principles and practices were adhered to during the RI/FS process and whether the findings, conclusions and recommendations of these reports are technically sound or warranted. Detailed comments on the four technical reports are presented in Appendix A.

2.0 DISCUSSION OF TECHNICAL FINDINGS

Detailed review of USEPA's technical reports for the Remedial Investigation, Baseline Risk Assessment, and Feasibility Study raises questions with respect to USEPA's characterization of 1) the extent and significance of contaminant migration, 2) the magnitude and significance of existing risks, and 3) the appropriate level of remedial response.

2.1 Extent of Contaminant Migration

The data obtained by USEPA during the Remedial Investigation do not support the conclusion that the buried lagoon and active landfill are significant sources of actively migrating chemical constituents. Groundwater data from the site show that the extent of contamination emanating from the buried lagoon and landfill areas is limited to the immediate vicinity of the lagoon, even after more than 15 years of uncontrolled infiltration of precipitation through these materials without any engineered controls to limit potential pollutant migration. The soil boring data obtained by drilling through the buried lagoon materials can not be relied upon to establish the extent of subsurface impacts because of 1) possible carry-down of contamination during the collection of samples due to the sticky nature of the waste materials, and 2) the inappropriate combination of soil vapor data measured with three different instruments.

2.1.1 Groundwater Data

The groundwater data for the site simply do not show the presence of contamination attributable to the buried lagoon materials or the landfill area. If the buried lagoon materials and landfill area were sources of contaminants for groundwater, a plume -- a coherent, consistent pattern of contamination -- would be present. The absence of an identifiable groundwater plume is a strong indication that the buried lagoon materials have very little current or future environmental mobility, and that the landfill area is not a significant source of releases to the environment. Given the setting of the buried lagoon materials at the site (above the water table and below 20 feet of demolition debris), this lack of mobility means that there is no mechanism for exposing individuals or organisms to these materials, and the lack of exposure means that there is no risk to human health and the environment.

A significant reason for the restricted extent of contaminant migration from the buried lagoon into groundwater is the environmental immobility of pesticide and polynuclear aromatic compounds, which have a much greater affinity for being adsorbed onto soil particles than being dissolved in water. The effects of this behavior are unambiguously illustrated by the site data -- not one pesticide or polynuclear aromatic compound was reliably found (i.e., consistently reported at similar concentrations without estimation or possible artificial origin) in groundwater, even at wells nearly adjacent to the buried lagoon. In fact, USEPA's Proposed Plan states:

> *"The majority of compounds in the waste lagoon are largely immobile, because they bind tightly to the clayey soils below the waste lagoon, and are not dissolved by water." (pg. 5)*

Analytical data for groundwater samples also show that even the more mobile volatile organic compounds (VOCs) are not migrating away from the buried lagoon. Tabulation of groundwater data by well for the four rounds of sampling during the Phase I and Phase II Remedial Investigations shows that toluene, the chief volatile constituent in the buried lagoon materials, is not reliably found in any well on the site. USEPA's Proposed Plan states:

> *"Significant migration has been hindered, to date, by the clayey soils under most of the waste lagoon and because the waste lagoon is normally wholly above the water table." (pg. 9)*

2.1.2 Soil Boring Data

The extent of impacts in the soils beneath the buried lagoon materials has been over-estimated in the RI/FS for the following reasons: 1) the waste lagoon (WL) borings were drilled through the waste materials, instead of being angled in from the side (so they would not have to be drilled through waste materials); based on the nature of the wastes and the analytical data from these borings, this very likely resulted in waste materials being carried down along the borehole by the drilling equipment; and 2) field screening data -- organic vapor readings on soil samples from the WL borings obtained using three different field instruments-- were used to characterize the extent of soil impacts; because these data are not truly comparable, this resulted in an inaccurate assessment of impacts.

<u>Carry-Down</u>

Several of the WL borings encountered sticky, tar-like or oily materials at the position of the bottom of the buried lagoon. These materials proved to be so persistent that they had to be sand-blasted off the augers during decontamination, even after the prolonged abrasion of drilling the hole and reversing the augers to abandon the boring. This indicates a high likelihood that such materials were carried down the boring with the augers, making the final sampling data inaccurate.

Other evidence supporting the likelihood of carry-down includes the presence of a piece of concrete recovered from boring WL-04 at a depth of 23.5 feet, below the bottom of the buried lagoon (and the bottom of the overlying demolition debris). Since all samples recovered both below and for seven feet above this depth were natural soils, the only way the concrete could have gotten to this depth is by falling into or being dragged down the borehole.

The analytical data for soil samples from the WL borings support rather than contradict the hypothesis that carry-down occurred. There are often rather remarkable similarities of compounds and concentrations among samples from a given borehole, typically showing essentially no change in concentration with depth. If a compound had migrated downward with percolating recharge or by other natural mechanisms, its vertical concentration profile would gradually decrease with depth. On the other hand, a nearly constant concentration vs. depth relationship would be expected if carry-down had occurred.

Soil Vapor Measurements

The Phase II Remedial Investigation Report placed substantial weight on field screening data when presenting and characterizing the extent of impacts in soils beneath the buried lagoon (i.e., Figures 5.1 through 5.5). There are several problems with this approach. First, the data were obtained using three different organic vapor instruments -- an OVA, an HNu, and an OVM. Because these instruments use different detection technologies, they are sensitive to different chemicals. For example, an OVA will detect methane but an HNu will not. In addition, since the readings are qualitative rather than compound-specific, the data are not comparable.

Second, comparison of the field screening data and the analytical data indicates that the field screening data are not a reliable indicator of the concentration of VOCs present in the sample. Rather, there is a tendency for high field screening readings to be associated with sandy soils and low readings to be associated with clayey soils -- regardless of the concentration of VOCs in the sample. This is understandable because air/vapors can move more readily through sandy soils and sandy soils will present a greater surface area to the air/vapor phase during testing. Rather than using the field screening data to characterize the extent of soil impacts, the Phase II Remedial Investigation should have placed greater emphasis on the data obtained from laboratory analysis of these materials.

2.1.3 Implications for Future Migration

In addition to showing that minimal contaminant migration has occurred to date, the data from the Remedial Investigation also suggest very strongly that future migration will not be significant, contrary to assumptions made in the Baseline Risk Assessment. During the 15-year period between the burial of the lagoon materials in 1976 and the conclusion of the Phase II Remedial Investigation in 1991, precipitation (i.e., rain, sleet, and snow-melt) that fell on the buried lagoon was free to percolate through the potential source materials and migrate to the water table. The existing groundwater data show that the amount of migration that **actually** occurred during this time is very limited. If the buried lagoon materials were going to release a significant amount of contaminants as postulated in the Baseline Risk Assessment, these compounds should already be showing significant mobility. In fact, this mobility has not been demonstrated by the data.

2.2 Risks from Existing Conditions

The Baseline Risk Assessment has overstated the degree of human health risk posed by the site under existing site conditions. In the Baseline Risk Assessment, USEPA calculated chemical-specific, risk-based, maximum acceptable concentrations for various chemicals of concern based on a 10^{-4} to 10^{-6} risk level for carcinogens and a hazard index of 1.0 for non-carcinogens (as specified in the NCP). The only carcinogenic risk exceeding the upper threshold of one new case of cancer among a population of 10,000 individuals similarly exposed over their lifetime (10^{-4}) was the 10^{-2} risk calculated for direct exposure (dermal absorption and/or ingestion) to on-site soils. This exposure pathway also represented the greatest part of the non-carcinogenic risks. However, the calculation of these risks used both improper data and improper methods.

2.2.1 Improper Data

The Baseline Risk Assessment improperly included data from a soil sample now buried by four to eight feet of debris among the data used to calculate risks from direct contact to on-site soils. During the Phase I RI, a sample collected from the surface at location SS-07 reportedly contained one of the PCB isomers (Arochlor 1254) at a concentration of 980 ppm. Inclusion of this data point in the evaluation of risks posed by direct contact (dermal absorption and/or ingestion) with on-site soils resulted in a calculated cancer risk of 10^{-2}.

However, examination of the topographic maps from the Phase I and Phase II RI reports clearly shows that this location is now under at least four to eight feet of debris that USEPA allowed to be placed at the site after 1985 and is not available for direct contact by humans. If this data point is excluded from the evaluation of risks, the existing cancer risks from direct contact with on-site soils are only slightly higher than 10^{-4}, the upper limit of the acceptable risk range.

2.2.2 Improper Methods

USEPA improperly assumed a residential rather than recreational exposure pathway for direct contact with surface soils located more than 1000 feet from the nearest permanent residence. The risks calculated by USEPA for the seven polynuclear aromatics, pesticides, and dioxins mentioned above assumed direct contact through residential land use. However, the three locations at which these compounds were found are more than 1000 ft from the nearest permanent residence. Thus, the actual risks, which are more appropriately considered as resulting from direct contact through recreational land use -- and which should have been calculated using "at-the-surface" soil concentrations of chemicals instead of all concentrations "near-the surface", will be below 10^{-4}, within the acceptable risk range as defined by the NCP.

USEPA failed to include average-case conditions in its Baseline Risk Assessment. Due to the often overly conservative and potentially unrealistic nature of worst-case estimates, the current guidance for risk characterization has identified the need to evaluate "average-case" risks. The need for addressing central tendencies of risk was outlined in a February 26, 1992 memorandum from F. Henry Habicht II (USEPA Deputy Administrator, Office of the Administrator) to Assistant Administrators and Regional Administrators. In this memorandum, Habicht stated (pg. 21):

> *"EPA risk assessments will be expected to address or provide descriptions of (1) individual risk to include the* ***central tendency*** *and high end portions of the risk distribution, (2) important subgroups of the population such as highly exposed or highly susceptible groups or individuals, if known, and (3) population risk. ... With the exception of assessments where particular descriptors clearly do not apply, some form of these three types of descriptors should be* ***routinely*** *developed and present for EPA risk assessments." (emphasis added)*

If the Baseline Risk Assessment for the Skinner site had used average-case exposure point concentrations, exposure times, exposure frequencies, and exposure durations, it would likely result in baseline human health risks at least one order of magnitude lower than those predicted in the current report which used worst-case conditions. All exposure scenarios would, therefore, be well within the acceptable risk range, as defined in the NCP, without the need for further action.

The Habicht memo also states that "... worst case scenarios should not be termed high end risk estimates." The memo describes the worst case scenario as follows:

> *A "worst-case scenario" refers to a combination of events and conditions such that, taken together, produces the highest conceivable risk. Although it is possible that such exposure, dose, or sensitivity combination might occur in a given population of interest, the probability of an individual receiving this combination of events and conditions is usually small, and often so small that such a combination will not occur in a particular, actual population."*

Nevertheless, it is clear from the assumptions made throughout the Baseline Risk Assessment that a worst case analysis was performed. Among these assumptions are 1) that all of the selected chemicals of concern pose risks, 2) that these risks are additive regardless of differences in physiological effects, 3) that there is currently residential exposure to site-wide soils, 4) that there will be future residential exposure to the buried lagoon soils and future residential use of groundwater adjacent to the lagoon, and 5) that individuals will be exposed to the maximum concentrations of chemicals found at the site regardless of the physical setting (e.g., buried under 20 feet of debris) of the materials actually containing that concentration.

The net effect of these instances of improper methodology in the Baseline Risk Assessment is that current and future risks potentially posed by the site are overstated. Because these overstated risks were then used to develop the general response actions and to evaluate remedial alternatives in the Feasibility Study, the level of appropriate remedial action has also been overstated.

2.3 Regulatory Characterization of Site

USEPA, through the National Contingency Plan (NCP, March 1990; 40 CFR 300.430(a)(1)(iii)) and its CERCLA landfill guidance (Conducting Remedial Investigation/Feasibility Studies for CERCLA Municipal Landfill Sites, February 1991), has established a regulatory framework for evaluating the remediation of CERCLA municipal landfills. The CERCLA landfill guidance states (pg. ES-1):

> *"The NCP contains the expectation that containment technologies will generally be appropriate remedies for wastes that pose a relatively low-level threat or where treatment is impracticable. Containment has been identified as the most likely response action at these sites because (1) CERCLA municipal landfills are primarily composed of municipal, and to a lesser extent hazardous wastes; therefore, they often pose a low-level threat rather than a principal threat; and (2) the volume and heterogeneity of waste within CERCLA municipal landfills will often make treatment impractical."*

Nevertheless, the Proposed Plan justifies the selection of an incineration alternative on the basis that the buried lagoon materials constitute a "hot spot" as described in the CERCLA landfill guidance and a "principal threat" as described in the NCP. These characterizations of the site are not supported by the data obtained during the RI/FS.

2.3.1 Inapplicability of Hot Spot Concept

According to the CERCLA landfill guidance (pg. ES-3), treatment of hot spots within a landfill may be considered practicable when the wastes are situated in discrete and accessible locations within the landfill, when they present a potential principal threat to human health and the environment, and when the hot spot is large enough so that its remediation will significantly reduce the potential risks yet small enough that it is reasonable to consider removal and/or treatment. However, proper application of the CERCLA guidance indicates that the buried lagoon is not a hot spot because the buried lagoon material does not represent a principal threat (as discussed below), it is not accessible, and its remediation would not reduce site risks.

In the Proposed Plan (pg. 9), the mobility of liquid wastes potentially contained within as many as 7000 supposedly intact drums within the lagoon is used to justify the conclusion that there is a principal threat. There are several problems with this supposition. First, the method used to estimate the potential number of drums is questionable. The Feasibility Study (Appendix I) assumed that "as indicated from historical site observations" drums were stacked two-high, side-by-side within the entire area of geophysical anomalies. If this were even close to actual conditions, at least one of the eight waste borings drilled through this part of the buried lagoon should have encountered drums. In fact, no drums were encountered.

Second, the assumption that there are any intact drums within the buried lagoon is not supported by the evidence. In fact, aerial photographs taken in 1976 just before the lagoon was buried show that the drums present at that time were piled randomly along sloping surfaces and in swales, did not generally have lids, and showed signs of being rusted and partially crushed. The empty, crushed, and/or deteriorated condition of on-site drums was confirmed by observations made during an inspection of the site in 1985 by USEPA's REM II Contractor.

Thus, the USEPA's evidence does not support the supposition that there are discrete accumulations of large numbers of intact drums potentially containing free liquids at the site. Furthermore, the buried lagoon materials are currently buried under 20 feet of demolition debris and are clearly not accessible. Finally, as discussed below in Section 3, the excavation and incineration of these materials will not significantly reduce the potential risks posed by the site. In conclusion, there is no "hot spot" at the site -- neither the buried lagoon nor the landfill -- which would benefit by being excavated and separately managed.

2.3.2 Inapplicability of Principal Threat Concept

Based on the NCP and on USEPA's discussions of principal threat in the Feasibility Study (pg. 3-5) and Proposed Plan (pg. 9), the key elements relevant to determining whether a principal threat exists are the presence of highly toxic and/or highly mobile contaminants that can not be reliably contained and which would pose a significant risk should exposure occur. The Phase II Remedial Investigation Report states:

> *"Chemicals of concern [in the buried waste lagoon] include volatile organic compounds, semi-volatile organic compounds, pesticides, metals and very low levels of PCB's, dioxins and furans. ... The pesticides revealed during the investigation are, however, largely immobile, bind tightly to the clayey soils and have a low solubility in water." (pg. 73)* and *"The base of the waste lagoon is located above the water table and direct interaction between the lagoon wastes and groundwater is minimal". (pg. 80)*

This language clearly indicates that the wastes are not "highly mobile". (See also the quotation from the Proposed Plan, pg 5, cited above, and Section 2.1 of this document). The Phase II Remedial Investigation Report further indicates that the VOCs detected (sporadically) in the groundwater downgradient of the lagoons are a result of surface water infiltration through the waste-- a condition typically found at landfills which are not properly covered. This condition could be readily and reliably contained with the installation of a low-permeability cover and groundwater collection system.

The mere presence of the buried lagoon materials at the site does not mean that exposure will occur. Although future risk scenarios were based on residential use of the waste disposal areas and residential use of groundwater from this immediate area, USEPA representatives acknowledged at the May 20, 1992 public meeting that these uses are highly unlikely. An evaluation of the ability of USEPA's proposed cap design discussed elsewhere in this report shows that the cap will effectively prevent exposure by direct contact for about 8,300 years, even without maintenance.

Site data shows that no contaminants are actively migrating from the lagoon, not even the compounds with greater potential mobility (the VOCs). Since mobility will be further reduced by capping and since capping can effectively prevent future exposure, reliable containment of the buried lagoon is possible and exposures will not occur. Thus, applying the criteria established by the NCP to the Skinner Landfill clearly shows that the buried lagoon is not a principal threat at which treatment is practical.

3.0 DISCUSSION OF USEPA'S ALTERNATIVES

USEPA developed and evaluated five remedial alternatives in its FS:

1) No Action.

2) Excavation and incineration of the buried lagoon;
Capping of the stabilized incineration residuals and the landfill.

3) Capping of the buried lagoon and landfill with a "RCRA multi-media" cap.

4) Capping of the buried lagoon and landfill with an "Ohio solid waste" cap.

5) Excavation and incineration of the buried lagoon;
Capping of the stabilized incineration residuals and the landfill;
Treatment of VOCs in soils beneath the capped area with soil vapor extraction.

All of the action alternatives contained several common elements – fencing, deed restrictions, extension of public water supplies, groundwater diversion, groundwater collection and treatment, surface water and runoff control (provided by the capping), and monitoring. Although four action alternatives were listed, from a practical standpoint, USEPA evaluated only two alternatives – incineration and capping. The USEPA's preferred alternative is Alternative No. 5.

3.1 Discussion of USEPA's Comparison of Alternatives

In selecting the preferred remedial alternative, the Proposed Plan did not consider all of the nine evaluation criteria established by the NCP appropriately. According to the Proposed Plan (pg. 16), *"[a]ll alternatives under consideration (except the No Action alternative) are expected to be protective of human health and the environment in the long term"*. In addition, the Proposed Plan states that 1) the alternatives all meet chemical-specific ARARs to the same degree (pg. 17), 2) with one possible exception they all meet action-specific ARARs (pg. 17), and 3) they all meet location-specific ARARs (pg. 18).

However, this conclusion overlooks the fact that on-site incineration can not meet the location-specific ARAR of the State of Ohio's hazardous waste facility siting requirements. Section 3734.05(D)(6)(g)(i) of the Ohio Solid and Hazardous Waste Disposal Law states that:

> *"The [hazardous waste facility] board shall not approve an application for a hazardous waste facility installation and operation permit unless it finds and determines that: ... the active areas within the new hazardous waste facility ... are not located or operated within ... [t]wo thousand feet of any residence, school, hospital, jail or prison".*

This requirement can not be met at the Skinner site.

The Proposed Plan also states that all of the USEPA alternatives meet the objective of reducing contaminant mobility, toxicity, and volume through treatment with respect to groundwater, but that incineration alternatives are more effective because they provide additional treatment of the buried lagoon soils (pg. 18). However, this conclusion overlooks the following facts: 1) incineration would actually *increase* the amount of waste materials disposed on the site because the volume of the waste materials would not be reduced during burning, and because stabilization of the resulting ash would require the addition of material to the waste; and 2) capping (although it is not treatment) minimizes percolation and thereby reduces the movement of contaminants to the groundwater, thereby reducing the volume of potentially contaminated groundwater and reducing its potential toxicity.

The Proposed Plan acknowledges that the incineration alternatives are *"considered to be less protective of human health and the environment over the short-term"* (pg. 18); however, the magnitude and significance of the additional risks involved were not fully assessed. The Proposed Plan incorrectly concluded that incineration is more effective in the long-term and more permanent than containment. This is not the case because 1) the proposed caps are capable of resisting erosion for approximately 8,300 years even if they are not maintained, and 2) the incineration alternatives involve landfilling of the residual ash which means that re-evaluation of the site will still be required every five years.

The Proposed Plan also incorrectly concluded that all alternatives were *"equally implementable"* (pg. 19) because it failed to fully consider that the technical requirements for designing, permitting and operating an incinerator have significantly greater complexity than those for containment. In addition, because all of USEPA's alternatives meet the requirements of the NCP, and because incineration is no more permanent than containment, cost-effectiveness was not appropriately considered. If USEPA's containment alternatives did not sufficiently meet the objective of treating on-site soils, a less costly alternative that combined containment with limited treatment of highly contaminated soils should have developed and evaluated as part of the Feasibility Study. (See Section 4 of this document.) Finally, it is clear from the comments made at the two public meetings that there are strong community objections to on-site incineration, and that capping has greater community acceptance.

In addition to inappropriately considering the nine NCP criteria, USEPA's selection of a remedial alternative did not use all applicable USEPA guidance. The EPA's Risk Assessment Guidance for Superfund: Volume 1-Human Health Evaluation Manual, Part B (EPA/540/R-92/003), which provides methodologies for the development of risk-based preliminary remediation goals for CERCLA sites, was not used. Nor was Part C of this guidance (EPA/540/R-92/004), which provides methods for assessing remedial alternatives and their associated human health risks during the evaluation and comparison of alternatives in the FS.

3.2 Problems with Excavating Buried Lagoon Materials

Excavation of the buried lagoon materials for on-site incineration unnecessarily poses potential unknown risks, creates new risks, and increases existing risks. USEPA considered only one of the potential risks posed by excavation in its FS in spite of the existence of considerable CERCLA guidance on the assessment of some of these risks. Excavation of these materials also involves as yet undefined operational and materials handling problems that have the potential to substantially delay implementation of the remedy and/or prolong the duration of induced higher-risk conditions. USEPA also failed to consider the risk and implementability impacts of these problems.

3.2.1 Unassessed Risks

Pathways

Without excavation there is no direct pathway for exposures to the contaminated buried lagoon soils because they are currently under an average of 20 feet of debris. By excavating these soils, new pathways are created and the potential for exposures and subsequent risks increases dramatically. Among these new pathways are the potential for dissemination in the environment by surface water runoff, by enhanced infiltration of precipitation through the open excavation, and by fugitive dust aerosol generation. These mechanisms could increase the potential health risks associated with exposures to site surface water bodies, sediments, and previously uncontaminated soils and air.

Figure 1 compares the number of exposure pathways associated with implementation of each remedial alternative. The figure shows that excavation and incineration alternatives create four additional pathways, doubling the number of potential exposure routes. Although the amount of risk posed by each pathway may vary, in general, the greater the number of pathways, the greater the risk of implementing the alternative.

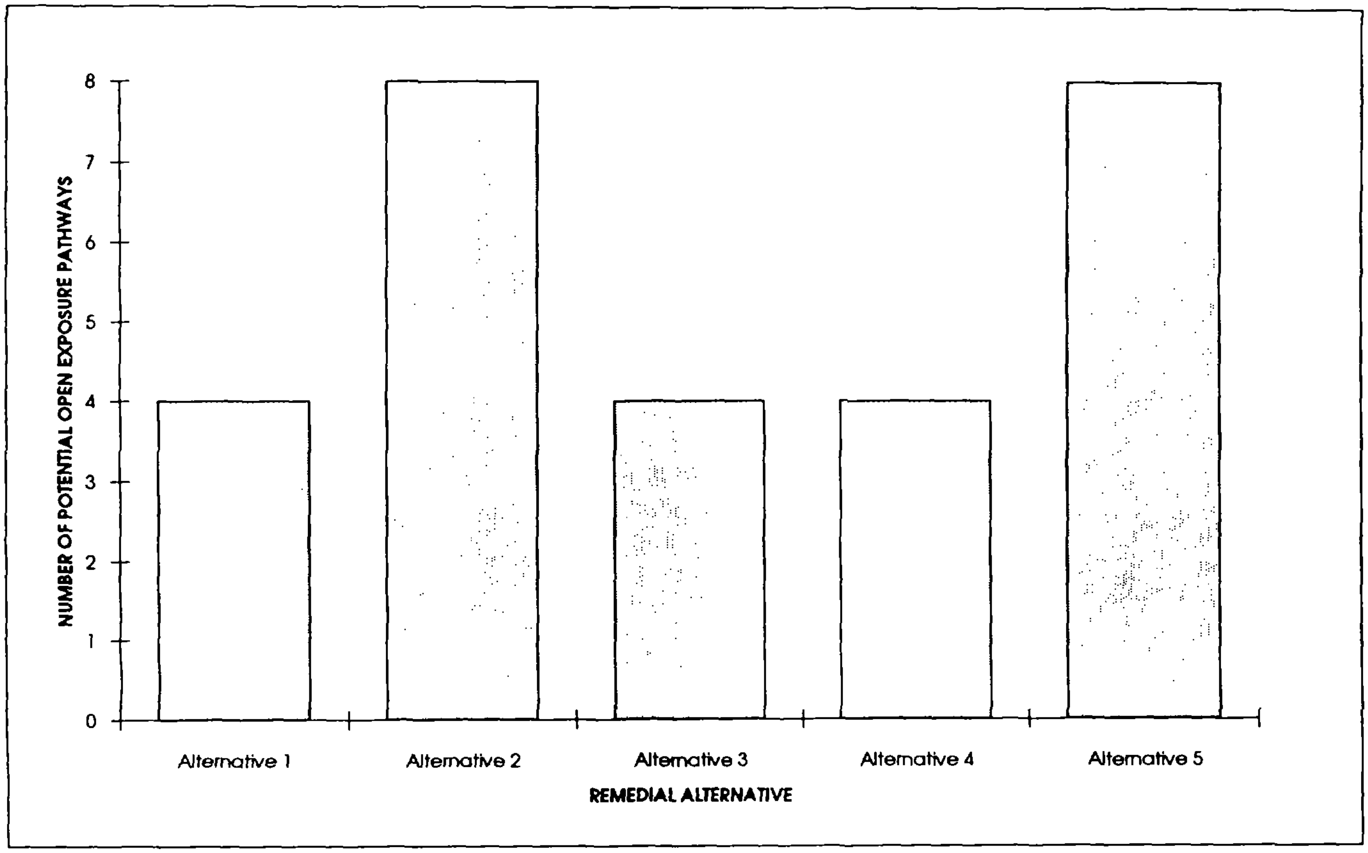
Risk Factors

In addition to creating new pathways, excavation of the buried lagoon soils could expose remedial workers and the surrounding community to a variety of new physical, biological, and nuisance hazards. The RI reports identified a number of organic and inorganic chemicals in these soils, and noted that nerve gas, mustard gas, incendiary bombs, phosphorus, flame throwers, cyanide ash, and explosive devices were reported to have been buried in the landfill. In addition, methane gas and biohazards (i.e., pathogenic bacteria/yeasts) are often associated with sanitary landfills. Excavation of the buried lagoon soils will necessarily involve several hazards associated with these materials including explosivity, flammability, combustibility, infectious diseases, chemical toxicity, nuisance odors, and fugitive dust generation.

Figure 2 compares the number of potential risk factors associated with each alternative. It is clear that the capping alternatives provide significantly fewer potential risk factors to workers and the surrounding community. In fact, the no action alternative poses fewer potential risk factors than the incineration alternatives. The excavation of buried lagoon materials followed by on site incineration results in the greatest number of potential risk factors due to the diverse and heterogeneous nature of materials found on site.

FIGURE 1

COMPARISON OF THE NUMBER OF POTENTIAL EXPOSURE PATHWAYS
ASSOCIATED WITH EACH REMEDIAL ALTERNATIVE
DURING IMPLEMETATION



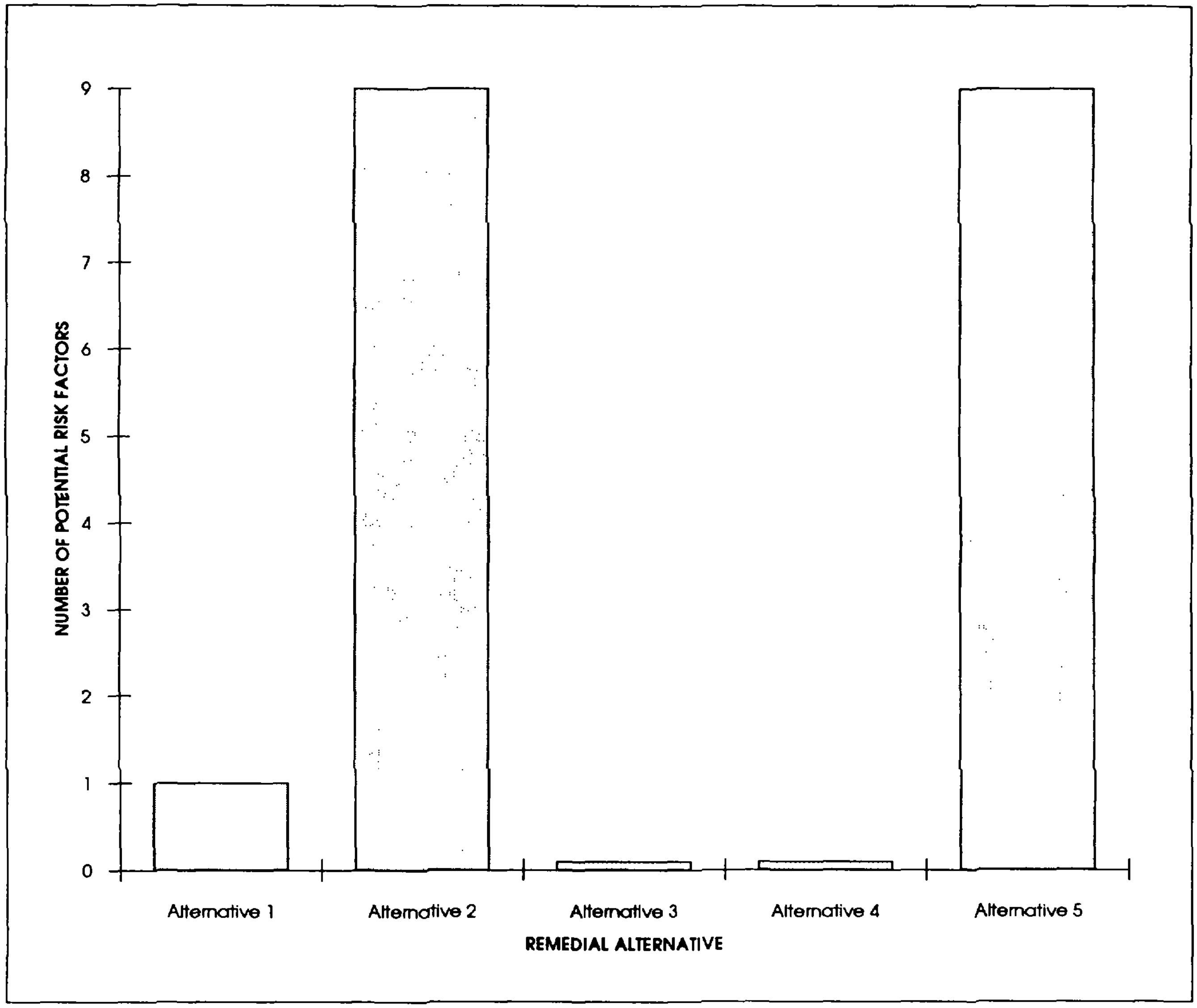
Alternatives
1 - No Action
2 - Excavation and on site incineration of the buried lagoon; capping of the incineration residuals and the landfill.
3 - Capping of the buried lagoon and landfill with "RCRA multi-media" cap.
4 - Capping of the buried lagoon and landfill with "Ohio solid waste" cap.
5 - Excavation and on site incineration of the buried lagoon; capping of the incineration residuals and the landfill. treatment of VOC-contaminated subsurface lagoon soils with soil vapor extraction.

Potential Pathways
1. Soil Ingestion/Dermal Contact
2. GW Ingestion
3. GW Household Use (Dermal contact, vapor inhalation)
4. Surface Water&Sediment Ingestion/Dermal Contact
5. Inhalation of Vapors
6. Inhalation of Particulates
7. Ingestion/Dermal Contact with settled ash-contaminated soils
8. Ingestion/Dermal Contact with settled ash-contaminated surface water and sediment

Note: Exposure pathways 1-8 correspond to the respective areas on the above bar graph Y-axis.

FIGURE 2

COMPARISON OF THE NUMBER OF POTENTIAL RISK FACTORS
ASSOCIATED WITH EACH REMEDIAL ALTERNATIVE



<u>Alternatives</u>

1 - No Action
2 - Excavation and on site incineration of the buried lagoon;
capping of the incineration residuals and the landfill.
3 - Capping of the buried lagoon and landfill with "RCRA multi-media" cap.
4 - Capping of the buried lagoon and landfill with "Ohio solid waste" cap.
5 - Excavation and on site incineration of the buried lagoon;
capping of the incineration residuals and the landfill.
treatment of VOC-contaminated subsurface lagoon soils with soil vapor extraction.

<u>Potential Risk Factors</u>

1. Chemical toxicity *
2. Explosivity *
3. Emissions
4. Fire/explosion from methane
5. Flammability/combustibility *
6. Particulates
7. Pathogenic microbes *
8. Noise
9. Odor

* Indicates that chemical, biological and incendiary devices are included.

Note: Risk factors 1-9 correspond to the respective areas on the above bar graph Y-axis.

Qualitative Risk Comparison

A qualitative comparison of the relative risk among USEPA's alternatives can be made by considering the number of chemical, physical, biological, and nuisance risk factors associated with each alternative and the time required to complete it (Figure 3). For the purposes of this comparison, each potential risk factor was weighted to reflect its relative risk. For the existing site conditions, the only associated risk factor is chemical toxicity. This factor was given a weight of 4, and the remaining risk factors were each assigned a weight based on their expected relative risk magnitude when compared with chemical toxicity. The total weighted risk for all of the risk factors is 20.

The capping alternatives remove the chemical toxicity risk factor over the estimated 6 months required for construction without involving any other risk factors. Unlike the capping alternatives, the excavation/incineration alternatives show no reduction of risk for 42 months during the time required for permitting, test burns, reviews, and system modifications. Once excavation and incineration begin, the number of potential risk factors increases. These elevated risk factors would remain constant until incineration is completed, a period estimated to be as much as an additional 24 months. As the incinerator was then decommissioned over a 6 month period, risk would be reduced to a low residual level. Thus, incineration would require at least 66 months more than capping to reach the same residual risk level.

The relative risks associated with each alternative can also be evaluated by comparing the amount of time a population at risk may be potentially exposed to the various risk factors associated with completing the various phases of each alternative. This can be estimated by integrating the risk levels over time (i.e., summing the "number of months" x "weighted risk" for each phase of implementation). For example, the "total potential exposure months" for Alternative 1 are the number of months (78) times the weighted risk (4) or 312. Essentially, this evaluation compares the area under the risk-lines shown in Figure 3.

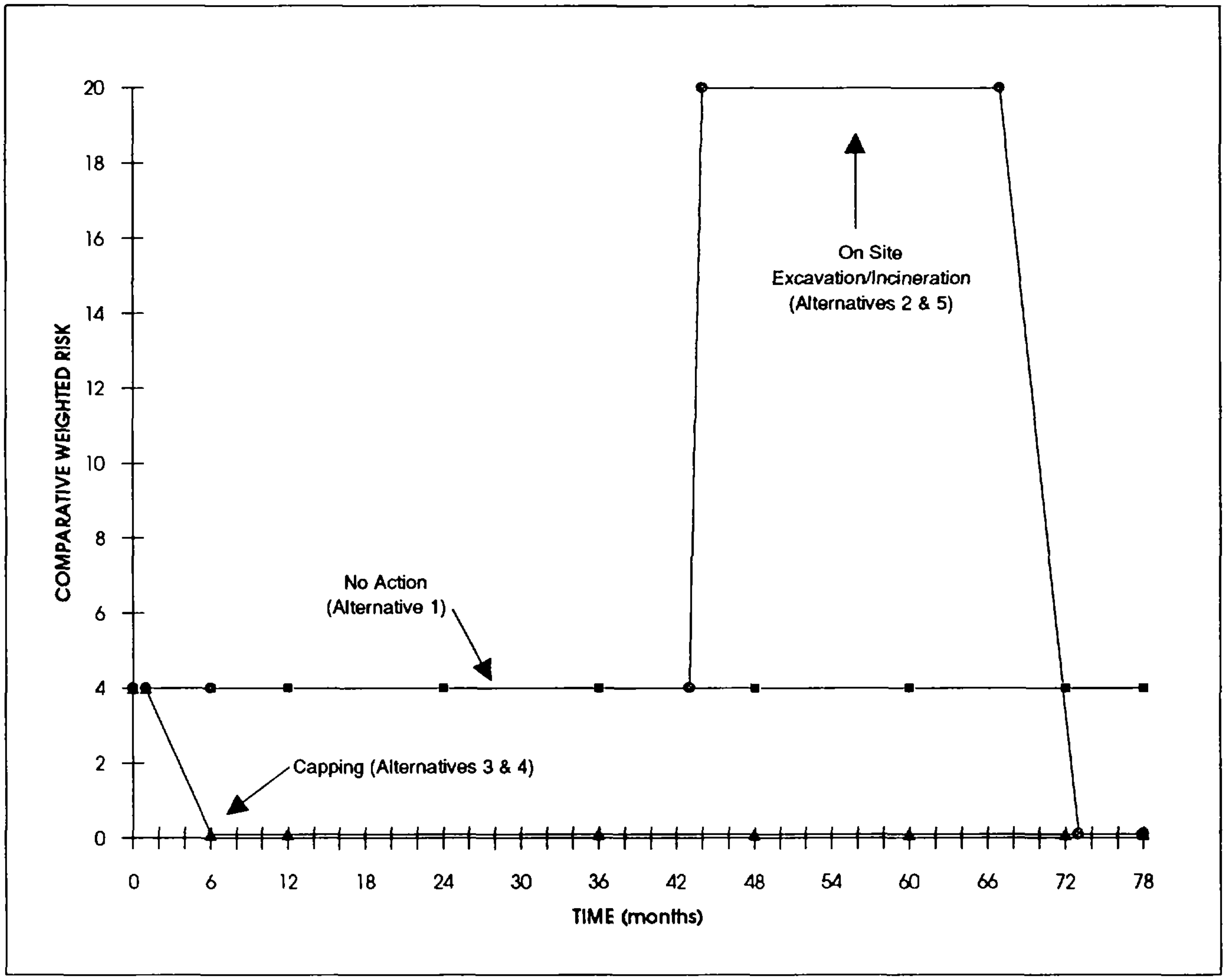
The results of this evaluation are presented in Figure 4, further illustrating that excavation and incineration alternatives present significantly greater total potential exposure than the capping alternatives. This is due to the creation of new exposure pathways, the resultant elevated number of weighted risks, and the increased time to implement incineration. This analysis did not consider the effects of potential operations delays, or the possibility of only operating the incinerator during school vacations, as suggested by USEPA during the July 29, 1992 public meeting. Thus, there may be intentional as well as unintentional extensions to the schedule of the incineration alternatives, causing the heightened risks of implementation to be prolonged.

Consistency with Guidance

Although the Feasibility Study addressed the potential risk to workers and the neighboring community associated with volatilization of materials during excavation of the buried lagoon, it did not fully consider all of the potential risks, or the potential additive effects, in its selection of a preferred remedial alternative. For example, the Feasibility Study did not consider the risks due to the creation of particulate aerosols during excavation.

FIGURE 3

COMPARISON OF THE POTENTIAL WEIGHTED RISK ASSOCIATED WITH
EACH REMEDIAL ALTERNATIVE OVER THE REQUIRED IMPLEMENTATION TIMES



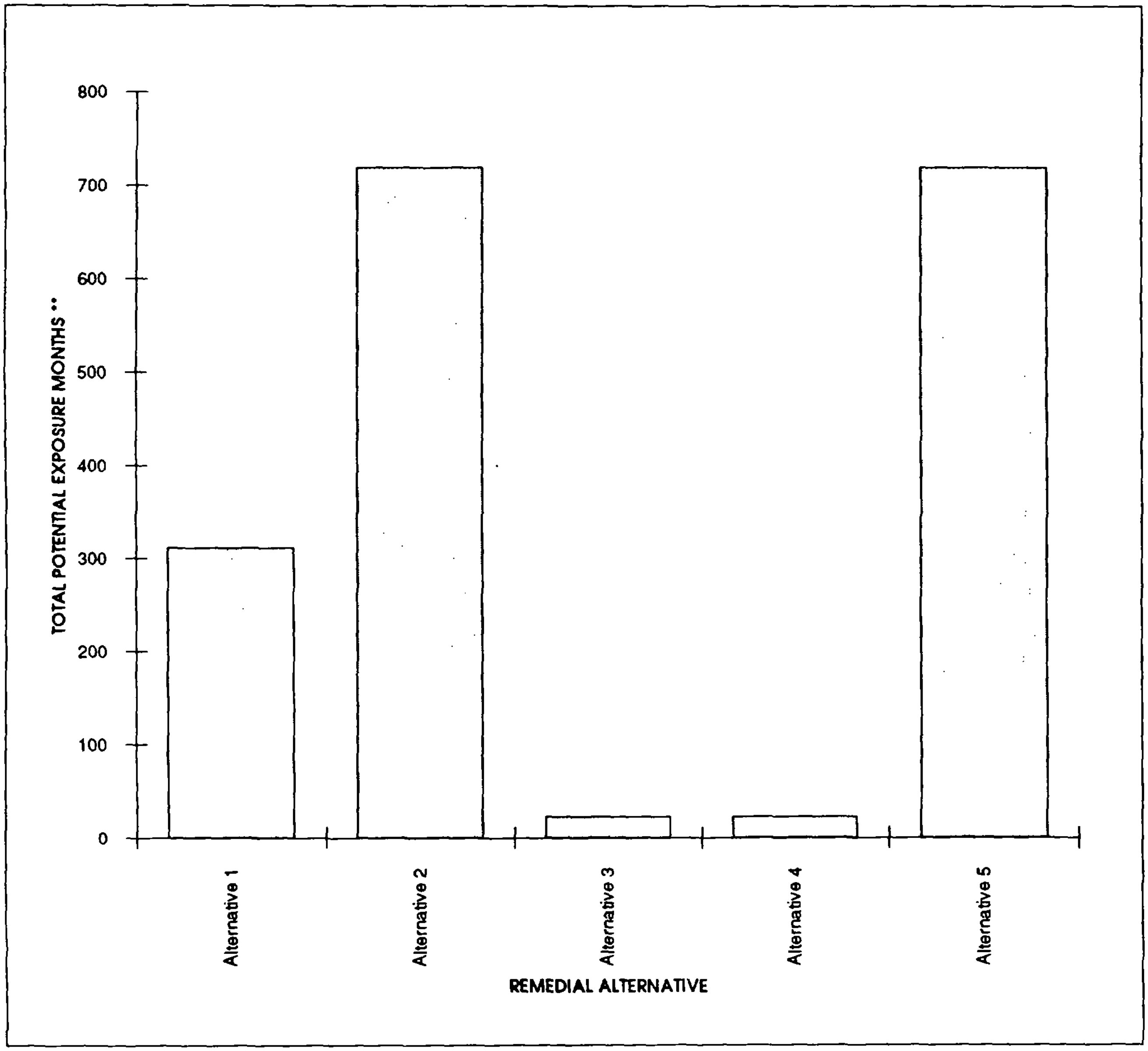
Potential Risk Factors	Factor Weights
1. Chemical toxicity *	4
2. Explosivity *	4
3. Emissions	3
4. Fire/explosion from methane	2
5. Flammability/combustibility *	2
6. Particulates	2
7. Pathogenic microbes *	1
8. Noise	1
9. Odor	1

* Indicates that chemical, biological and incendiary devices are included.

Note: The only risk factors associated with the the No Action Alternative (Alt. 1) is chemical toxicity (weighting factor of 4). All of the other risk factors are associated with excavation and on-site incineration (total weighted risk of 20).

FIGURE 4

COMPARISON OF THE TOTAL POTENTIAL EXPOSURE MONTHS **
ASSOCIATED WITH EACH REMEDIAL ALTERNATIVE
DURING IMPLEMENTATION



** Total Potential Exposure Months = an accumulation of the number of months a population at risk may be potentially exposed to the weighted risk associated with completing each remedial alternative (sum of: Months x Weighted Risk) (i.e., Fig. 3 area under curve).

Alternatives

1 - No Action
2 - Excavation and on site incineration of the buried lagoon;
capping of the incineration residuals and the landfill.
3 - Capping of the buried lagoon and landfill with "RCRA multi-media" cap.
4 - Capping of the buried lagoon and landfill with "Ohio solid waste" cap.
5 - Excavation and on site incineration of the buried lagoon;
capping of the incineration residuals and the landfill.
treatment of VOC-contaminated subsurface lagoon soils with soil vapor extraction.

Many of the contaminants present in these soils tend to be adsorbed to the soil particles and will not readily volatilize. As buried lagoon soils are excavated and transported to on-site or off-site locations, fugitive dust aerosols may be created. The risks associated with these fugitive dust aerosols may be significant, especially when combined with risks due to volatilization.

USEPA has a number of guidance methodologies to be used in estimating the risks from fugitive dust aerosols [Compilation of Air Pollutant Emission Factors, Vol. I, Stationary Point and Area Sources, 4th Ed., Office of Research and Development, 1985; Superfund Exposure Assessment Manual, 1988 (EPA/540/1-88/001); Air Superfund National Technical Guidance Series, Vol. IV, Procedures for Dispersion Modeling and Air Monitoring for Superfund Air Pathway Analysis, Interim Final, 1989 (EPA/450/1-89/004)]. Apparently, these documents were not used in the Feasibility Study, which is therefore inconsistent with available and appropriate guidance.

3.2.2 Potential for Delays and Prolonged Risks

From the operational and materials handling perspectives, a number of situations could develop that would cause substantial delays during excavation of the buried lagoon materials resulting in greater potential risk. Delays could be caused by unexpected conditions during removal of the demolition debris, by unexpected situations for which health and safety precautions have not been prepared, and by unexpected schedule coordination problems with the actual burning of the soils in the incinerator.

USEPA has estimated that 40,800 cubic yards of demolition debris overlying the buried lagoon materials will need to be removed, shredded, and subsequently placed beneath the final cap. This material potentially includes large pieces of reinforced concrete, asphalt, roofing shingles, wires and cables, lumber, dry wall, grass clippings, brush, and a wide variety of metal objects. The extremely diverse nature of this material makes proper selection and sizing of excavation equipment difficult. On the one hand, the excavation contractor may experience delays because he does not have the proper equipment to perform the work at the site; and on the other hand, he may have unnecessary pieces of equipment on site thereby wastefully increasing the cost of remediation.

In the event that unknown materials are encountered which cannot be incinerated (i.e. explosive wastes or non-combustible hazardous wastes), lengthy delays and substantial cost over runs can be expected. The excavation of such materials would need to be performed carefully by an experienced contractor under strict health and safety conditions. Significant time could be lost due to the need to procure and mobilize an acceptable contractor as well as to painstakingly proceed with the excavation.

USEPA has assumed that the bulk of the excavation work will be performed with minimal health and safety protection using conventional excavation techniques. However, due to the diverse and heterogeneous nature of the waste, this assumption could be unrealistic, resulting in an emergency situation for which the contractor is not properly prepared. Furthermore, in the event materials are encountered which necessitate modifications to the method of excavation and level of health and safety protection, the duration and cost of excavation would be greatly increased.

Delays may also be encountered in matching the production schedule of the excavation work with the production schedule of incineration. Excavation activities need to be carefully coordinated with incineration start up and operation to minimize the need for stockpiling, and rehandling of soil. Failure to carefully coordinate these activities will result in the excavation being kept open for an extended period of time. In the event of incinerator shut down, it may be necessary to temporarily suspend excavation activities or stockpile excavated material elsewhere on site.

3.3 Other Problems with Incineration

The incineration alternatives have several other problems in addition to those associated with excavation of the buried lagoon materials. The RI/FS did not provide the data needed to identify the most appropriate incineration technology, if any, and its associated operational constraints. The potentially significant scheduling impacts of the permitting process were not fully acknowledged, nor were the risks or incineration and the potential for operational delays to prolong these risks. In addition, USEPA has overstated the permanence of its incineration alternatives and understated the likely costs.

Off-site incineration, which was screened out as an alternative by USEPA, has all the disadvantages inherent to on-site incineration because it would still involve excavating and handling the wastes and impacted soils. Off-site incineration would have additional disadvantages associated with staging materials and loading long haul vehicles. Existing commercial incinerator facilities that could accept wastes from the site have current backlogs of two to three years, and the potential volume of waste from the site is large relative to their operating capacities. Thus, there could be delays both with initiation of an off-site remedy as well as during its implementation. Transportation of the wastes from the site would present additional risks and potential impacts because the waste material will need to be hauled through residential areas and in close proximity to the Union Valley elementary school. Vehicular accidents could result in the release of waste materials to the environment. Off-site incineration alternatives would also require the development of an Emergency Response Plan to address these potential risk as required by SARA Title III

3.3.1 Technology Selection

Based on a review of Records of Decision for similar CERCLA sites in the Midwest, on-site incineration as the selected remedy for hazardous waste sites has not gained wide acceptance due to the inherent problems in siting, permitting, constructing, and operating incineration systems. This is particularly true of waste sites with a wide variety of wastes such as the Skinner site. On-site incineration technology has been successfully employed at sites with well defined, uniform wastes. Such is the case with the use of low temperature thermal desorption technology for the management of petroleum contaminated soil. However, given the uncertainties caused by the diverse and heterogeneous nature of the waste materials at the Skinner Landfill site, it is not possible to properly evaluate the incinerator option or associated adverse impacts.

Effective production operation of an incinerator requires that the materials being fed into the incinerator be uniform. This is generally achieved by handling and processing the wastes between excavation and incineration. These activities could include screening the waste materials to obtain consistent size characteristics and the addition of bulking agents or other materials to improve the handling properties of the waste. In addition, different incineration technologies are better suited to treating wastes having specific physical and chemical characteristics.

Despite these constraints on effective operation of an incinerator, the existing characterization of the waste materials includes no information about the size range and/or composition of the "particles" that are to be incinerated. The Feasibility Study did not include any information regarding the physical properties that will affect handling (e.g., cohesiveness, stickiness, liquid content, etc.) In addition, the anticipated ash characteristics (including metals content) have not been assessed. Without this information, it is not possible to select appropriate equipment for preparing the wastes for incineration, nor is it possible to select the most cost-effective incineration technology.

The data presented in the Feasibility Study and the waste characterizations performed are inadequate for developing an incinerator permit application and to predict and evaluate the potential environmental impacts posed by the operation of the incinerator, its emissions, or its operating efficiency. The Feasibility Study acknowledges the potential for encountering wastes which cannot be incinerated, which will necessitate special provisions for separate handling and disposing of these problem wastes at off-site permitted disposal facilities.

Because the concentrations of hazardous constituents in the incineration feed cannot be predicted, it is not possible to properly assess the design and anticipated operating efficiency of an incineration unit. The Feasibility Study estimates that more than 20,000 cubic yards of material require incineration. However, due to the limited characterization of the waste mass and underlying soils in the RI/FS, the quantity of waste and contaminated soil to be incinerated could be significantly greater, increasing costs and implementation times.

At the July 29, 1992 public meeting, USEPA apparently proposed that the on-site incinerator would only operate during the school vacation. This approach poses very significant operational problems. First, effective length of the vacation period in this school district is no more than twelve weeks, of which perhaps two weeks up-front and two weeks at the end would be needed for mobilization and demobilization. This would leave only eight weeks for productive operation of the incinerator. Because the Feasibility Study likely underestimated the volume of material that might be incinerated and because it likely overestimated the production efficiency, incinerator operations could require as much as 15 years to complete.

The vacation-only approach would also be very cost-inefficient. First, there would be the unproductive costs associated with repeated mobilizations and demobilizations. Second, it is unlikely that a contractor would be willing to bring an incinerator on site and have it be idle for nearly 85 percent of each year without seeking some compensation for the down-time.

With respect to off-site incineration, the technology problem takes the form of a general shortage of commercial incinerator capacity. The closest facility that could accept wastes from the Skinner site is about 250 miles away in Grafton, Ohio, southwest of Cleveland. The next closest facilities are about 350 miles away in Sauget, Illinois, near St. Louis, or about 750 miles away in Baton Rouge, Louisiana, or in Coffeyville, Kansas.

All of these facilities have current backlogs extending for two to three years in the future, and the potential volume of waste from the Skinner site is large relative to their operating capacities. Thus, it would be difficult to secure adequate off-site disposal capacity for the Skinner wastes and to schedule for the timely removal, transportation, and disposal of waste and soil. In addition, off-site incineration is expensive. Current commercial incineration prices vary between $1,500 and $2,000 per ton, not including transportation, and these costs are likely to increase in the years ahead.

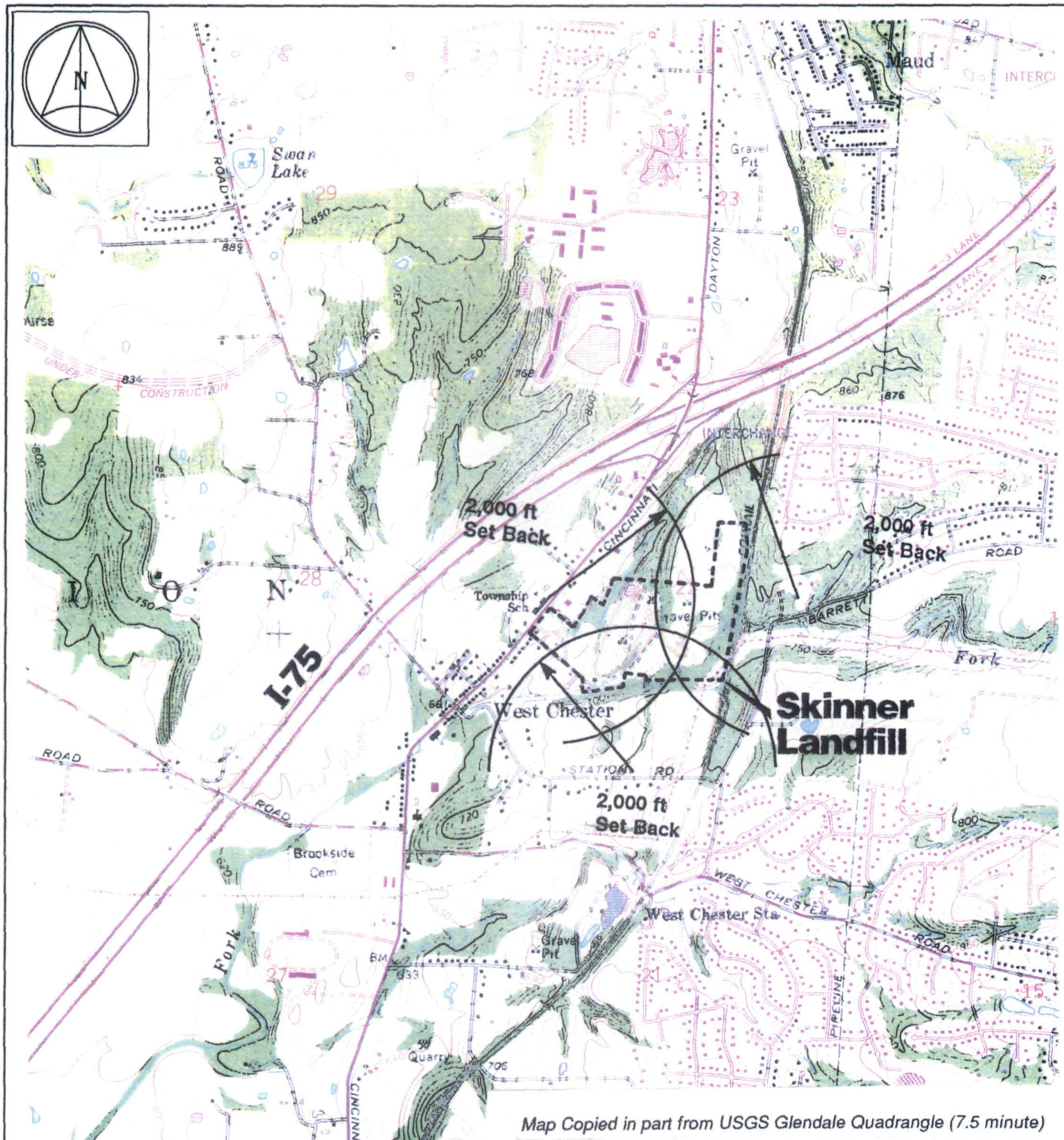
3.3.2 Permitting

Ohio Solid Waste regulations and USEPA RCRA regulations set forth requirements for the siting, design, permitting, construction, and operation of hazardous waste incinerators. The existing technical reports lack significant information that must be evaluated to comply with these requirements. USEPA proposes to gather this additional data in a series of small studies as implementation of the remedy proceeds. Given the nature and extent of these unknowns, there is a significant chance that this approach will result in multiple delays and substantial cost increases.

Of significant concern are the siting requirements of the Ohio solid waste regulations (Section 3734.05) which provide that a separation of 2,000 feet must be maintained between a hazardous waste incinerator and the nearest school or residence. This criterion can not be met at the Skinner Landfill because there is no area on the site where the set-back requirement can be satisfied (Figure 5). Although neither USEPA nor Ohio EPA have provided justification for avoiding the set-back requirement, it is possible that a variance may be obtained.

If on-site incineration is performed and the incinerator is sited as far as possible from residences and schools, its location would not be adjacent to the buried lagoon. As such, multiple handling of the wastes would be needed as the materials are excavated, screened and processed, temporarily stored near the excavation, loaded and transported to the incinerator location, and temporarily stored before burning. Each of these handling steps would increase the opportunity for exposures and increase costs.

Ohio regulations also provide for a comprehensive permitting process which includes detailed requirements for a test burn and system refinement. Complying with the substantive requirements of this process could easily take two to three years. Based upon public comment presented at the May 20, 1992 public meeting, it is clear that the public will oppose any alternative which is likely to cause delays in completing the remedy.



Map Copied in part from USGS Glendale Quadrangle (7.5 minute)

NOTE:
2,000 ft set back requirement from school or residences.
(Ohio Hazardous Waste Regulations 3734.05)

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DUNN CORPORATION 1333 Butterfield Rd., Suite 540 Downers Grove, IL 60515-5610	FIGURE 5 INCINERATOR SET BACK DISTANCE Skinner Landfill West Chester, Ohio
PROJECT NO.: 80197-00439	Scale: 1" = 2000' (approx)

With respect to off-site incineration, permitted commercial incinerators have very rigid material acceptance criteria which would require rigorous and detailed testing of each load of waste and soil delivered to the off site incinerator. In addition, commercial incinerators operate under strict state and federal permits many of which prohibit the acceptance of a wide range of waste materials. Unless the waste mass and soils are thoroughly characterized, it would be difficult if not impossible to enter into a contract for off-site incineration.

3.3.3 Risks and Delays

The on-site incineration of soils will result in unnecessary risks to human health by creating new potential risks, increasing existing potential risks, and creating nuisance noise and odors. The incinerator itself will create a significant amount of noise while it is running, thereby creating a potential hazard to remedial workers and a unacceptable nuisance to individuals in surrounding communities. The odors and emissions released during excavation of soils may also create hazards to workers and nearby residents. In addition, adverse reactions to odorous pollutants can be more that a nuisance or annoyance. Odorous substances can produce physiological responses which were not considered during the selection of the remedial alternative.

Although the incineration process is predicted to be extremely efficient, there could be volatiles, particulate pollutants (e.g., metals), and a variety of combustion products in the emission stream during start-up and in the event of a malfunction. The potential health effects from inhalation exposures to these materials is uncertain. Although these materials would be released to the ambient air, soil or water could also be impacted by natural deposition mechanisms. Therefore, potential health risks via direct inhalation, ingestion of impacted food chain and water supplies, as well as direct contact with soil or water are a concern. None of these risks have been addressed by the USEPA's technical reports.

During delays in the incineration process it will be necessary to stockpile soils on site. This practice will increase existing risks as discussed above since the potential for direct contact with the more heavily impacted soils would increase dramatically. This will result in increased risks to workers and area residents. Increased risks due to elevated levels of contamination in various media may occur as a result of surface water run-off and fugitive dust aerosol generation from the now-exposed impacted soils.

With respect to off-site incineration, there would likely be substantial difficulty in scheduling and coordinating the off-site management of the materials with the on-site excavation, staging, and stockpiling activities. There is the further problem that a load of material could fail the incinerator facility's acceptance criteria and be returned to the site. This could initiate a series of rolling delays in which the wastes would need to be re-characterized, the processing systems re-designed and re-built, and new permits obtained before the implementation of the remedy could resume. The implementation of an off-site remedy using the "vacation-only" operating approach proposed by USEPA during the July 29, 1992 public meeting would still have the effect of greatly extending the project schedule, and whole working seasons could be lost if waste acceptance or incinerator capacity problems arise.

3.3.4 Permanence

Incineration is not, in and of itself, a final disposal method because it is possible that some impacted soil will not be excavated because it may be infeasible to do so. Thus, one of the chief reasons for selecting incineration in spite of its considerably higher risks and incremental cost – that it would permanently destroy the wastes – is invalid. Furthermore, one of the primary objectives of treatment, which is to eliminate or minimize the need for long-term maintenance (40 CFR 300.430(g)(3)(i)), will not be achieved because the resulting ash will be landfilled at the site.

In addition, incineration produces an ash which must still be managed according to its characteristics. Because the incinerator feed has not been well characterized, it is not possible to predict the nature of the ash which would be produced. Nevertheless, the incineration alternatives proposed by USEPA include the stabilization of this ash and its burial on site. One of the consequences of this approach is that the volume of waste remaining on site after incineration would actually be greater than the existing waste volume. This situation results because the incineration of soil results in very little volume reduction. When stabilizing materials are added to the ash, the volume of waste becomes greater than the original volume of the soil.

A second consequence is that periodic CERCLA review of the site will still be necessary because waste materials will be left on site. Review of the NCP and related guidance shows that a primary reason for preferring and/or seeking permanence is to avoid the necessity of reviewing the performance and status of a remedy/site every five years. In this respect as well, *the USEPA's recommended incineration alternative is not a permanent remedy* because the landfill and the stabilized incineration ash will still be present on the site and the need for long-term site management will not be eliminated.

3.3.5 Cost Escalation

The costs for design of the incineration alternative estimated in the FS failed to include all site engineering design needs. Among the overlooked details are water supply, electric supply, natural gas supply, wastewater treatment design, wastewater discharge permitting, and foundation design. The costs associated with these design and permitting activities should have been itemized and included (OSWER Directive 9355.3-01, "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA", Interim Final, October 1988, Section 6.2.3.7). In addition, due to the limited characterization of the waste in the RI/FS, the true effort and estimated costs involved in permitting and carrying out the trial burn cannot be fully evaluated.

The cost estimate in the Feasibility Study did not include a decontamination and vehicle washing facility which will be needed because excavation equipment and haul vehicles will be entering an exclusion zone. The estimate also failed to provide for treatment of water collected during dewatering activities and equipment decontamination activities. The volume of collected water and associated treatment costs may be significant over the duration of excavation. Additionally, the cost estimate should have included the cost of treating the blow down water and particulates from the air emission control system.

According to USEPA's calculations, an estimated 40,800 cubic yards of construction demolition debris will need to be removed and processed prior to excavation of the waste and underlying soil. The estimated cost for this activity presented in the Feasibility Study is $1,290,000, or $31.62/cubic yard. Review of the assumptions made in the Feasibility Study shows that this estimate probably understates the true cost. It is likely that a 3-cubic-yard hydraulic excavator will not be able to handle the large pieces of reinforced concrete observed at the site. The need for additional equipment to remove the larger pieces of debris and the consequent greater costs should have been anticipated.

Also according to USEPA's calculations, an estimated 20,000 cubic yards of soil and waste would need to be excavated. It is possible that upon initiation of excavation work, the area of the actual excavation will be expanded. At present it is estimated that the incineration option will cost approximately $30,000,000, of which $3,000,000 (or $150/ton) is estimated as the actual operational cost of incinerating the soil and waste. If the volume of soil is significantly increased, there will be a commensurate increase in the operational cost of the incinerator.

The total incineration costs estimated by USEPA for engineering, construction, construction management, operations, maintenance, and contingencies are approximately $10,611,500, or approximately $530/cubic yard of soil incinerated. When the additional costs itemized above are included, the per cubic yard price will be significantly higher. As previously noted, USEPA's estimated cost does **not** include the additional cost of the off-site management of wastes which cannot be incinerated, or costs associated with excavation and management of explosive wastes. Revised cost estimates that account for this omission and for the omission and/or underestimation of quantities and unit costs shows that the actual costs of USEPA's incineration alternative is likely to be as much as $88.5 million (see Appendix B).

4.0 PRESENTATION OF THE APPROPRIATE REMEDY

An appropriate remedy (which combines features of several USEPA alternatives) would consist of the following elements: 1) a cap over the buried lagoon and active landfill areas; 2) soil vapor extraction beneath the buried lagoon, if feasible; 3) groundwater collection and treatment at the downgradient side of the potential source areas, if necessary; and 4) institutional controls (fencing, deed restrictions, and extension of public water supply).

4.1 Discussion of Capping

Placement of a cap over the buried lagoon and landfill materials will have several effects on the existing groundwater regime in this area of the site. The first effect will be to substantially reduce the infiltration of precipitation through the potential source materials. Based on the calculations presented in the Feasibility Study, a multi-media cap would reduce the volume of water infiltrating through the wastes by 99.9 percent. Since about 42 percent of precipitation is estimated to infiltrate through the waste under existing conditions, this means that less than one-twentieth of one percent of precipitation would infiltrate through the wastes after capping.

Thus, capping the buried lagoon and landfill materials eliminates the only currently active migration pathway with the potential to move contaminants away from the potential source areas and into other environmental media. In addition, the substantial reduction in recharge to the water table under the cap will cause a general lowering of the elevation of the water table in this area. Because the waste material is currently located above the water table, the lowering of groundwater levels will further isolate the waste materials from the groundwater by increasing the distance between the wastes and the water table. In addition, it will reduce hydraulic gradients in this part of the site, causing what appear to be very slow existing groundwater flow rates to become even slower.

In spite of these advantages, the Proposed Plan has arbitrarily selected incineration because it purportedly represents "permanent" treatment of the waste materials. In discussions concerning this issue, USEPA representatives stated that capping could not be considered permanent because a gully "might" erode through the cap **and the underlying demolition debris** and expose the buried lagoon materials at the surface to recreational users. If the Feasibility Study had included calculations of the expected erosion of the proposed cap designs, it would have determined that this scenario is improbable. The Feasibility Study did not include any calculation of this erosion.

Calculations of potential erosion from the USEPA's proposed caps were made in the course of preparing this technical comment document. Using the Unified Soil Loss Equation (USEPA's preferred method for evaluating erosion on landfill caps) and the landfill cap design presented in the Feasibility Study, the calculated annual soil loss due to erosion of the cap is 0.43 tons per acre per year, well below the USEPA's recommended limit of 2.0 tons per acre per year. Furthermore, based on the very low number calculated, sheetwash erosion -- rather than rill and gully erosion -- is indicated. Spread across the landfill on a per acre basis, the calculated soil loss is equivalent to 0.0024 inches per year. At this rate it will take 8,300 years to erode through the upper 20-inch topsoil layer of the cap.

The underlying gravel and cobble layers of the drainage/biotic barrier will be significantly more resistant to erosion than the topsoil layer for two reasons. First, there will be very little flow along the surface of the exposed gravel because the water will percolate into the layer. Second, what little flow may occur along the top of the layer will not have sufficient power to erode gravel-sized particles. Clearly, the long-term effectiveness and practical permanence of a cap are equal to those of incineration, and the residual risks are essentially the same because there is no likelihood that the buried lagoon materials could be exposed by erosion.

4.2 Treatment of Source Materials

Although capping of the buried lagoon and active landfill will substantially limit the mobility of wastes present in these potential sources and has the potential to reduce the volume and toxicity of future impacts to groundwater, Region V does not consider capping to be treatment. Among alternatives that provide overall protection, meet ARARs, and are equivalent with respect to long-term effectiveness and permanence, the NCP establishes a preference for alternatives that include treatment **provided that such treatment is cost-effective.** By modifying selected features of USEPA's containment alternatives, it is possible to provide treatment of potential source materials at the Skinner site for essentially the same cost as USEPA's containment alternatives.

Thus, the appropriate remedy for the site includes vapor extraction from the natural soils beneath the buried lagoon materials and possible treatment of the effluent airstream. This element of the remedy would be implemented if it is determined to be technically feasible through field-scale pilot testing. Vapors, potentially containing VOCs from the buried lagoon materials, would be extracted from the natural soils beneath this potential source area. To avoid the problems inherent in drilling through the waste materials, the individual collection or air-supply pipes would be installed by drilling on an angle or horizontally from the western side of the hill that contains the buried lagoon. The results of field testing would be used to determine the appropriate number and spacing of pipes, flow rates and vacuum pressures, the need for and most appropriate treatment technology for the airstream, and other operating parameters.

4.3 Groundwater Collection and Treatment

In light of the previous discussion concerning the virtual absence of reliably detected contaminants in groundwater at the site, the automatic selection of the same groundwater collection and treatment in all action alternatives is arbitrary. The need for groundwater collection and treatment has not been established and may warrant further study. To establish on a reliable basis that groundwater is being impacted by the buried lagoon materials, additional groundwater monitoring would be needed. Only after repeated, consistent detections of the same compounds can a conclusion be made that the buried lagoon materials are impacting groundwater. Such study can make use of the existing monitor well system.

Even if impacts to groundwater are indicated by the Phase I and Phase II RI data, none of the risks currently posed by groundwater or any of the media receiving discharges from groundwater exceed the upper end of the USEPA's acceptable risk ranges (carcinogenic >10^{-4}; hazard index >1). Thus, the need for groundwater collection and treatment is doubtful because no actionable risk is present even after more than 15 years of uncontrolled infiltration of precipitation through the potential source materials without engineering controls to limit migration. The Baseline Risk Assessment based the future risks for this medium on the residential use of groundwater, which even the USEPA has admitted is an unlikely occurrence. However, there is simply no reason to believe that future risks will be any different from those under the current use conditions.

The preceding discussion shows that the RI/FS did not collect the data needed to conclude that groundwater collection and treatment are necessary. The degree to which the buried lagoon and landfill materials are impacting groundwater under current conditions, and the effects of placing the cap over these areas were not addressed. If future studies show that groundwater collection and treatment are appropriate, several additional studies would be needed to design these systems. The existing soil and rock conditions along the proposed collection system and the flow rate and chemical concentrations of the influent will need to be defined in substantially better detail. At a minimum, the proposed trench and slurry wall can be replaced with a partially lined trench.

Regardless of the results of any studies to determine whether groundwater contamination is being caused by the buried lagoon material or to assess the effects of the cap on the local groundwater flow regime, the Feasibility Study was arbitrary in selecting up-gradient groundwater diversion structures (slurry wall and drainage trench), the need for which are clearly not supported by the evidence. Because groundwater is not currently in contact with the buried lagoon materials, up-gradient water flowing under these materials can become contaminated only if there is recharge percolating through them. As discussed above, the infiltration of precipitation through the buried lagoon materials would be precluded by capping.

4.4 Effects of Institutional Controls

The implementation of institutional controls can provide significant and immediate reductions in health risks, preclude (admittedly unlikely) future health risks, and be responsive to a community concern. Because the unacceptable health risks currently existing at the site all require direct contact with contaminated soil materials in order to occur, fencing the areas containing such soil would substantially reduce these risks. Although USEPA may consider this a temporary or supplemental action, there is no doubt that fencing could severely limit (and possibly preclude) access to the site and provide a prompt response to a community concern.

Deed restrictions could be used to prevent future residential uses of the buried lagoon and landfill areas, precluding residential exposures to the buried lagoon materials and the drinking or household uses of site groundwater. USEPA representatives have stated publicly that even without formal action, future residential use of this area is unlikely because residential use is not considered an acceptable reuse of former waste disposal areas.

In addition, the existing residential use of the property is not the same thing as residential use of the contaminated site, a fact not acknowledged in the Baseline Risk Assessment or

Feasibility Study. The Remedial Investigation shows neither the presence of surface soil contamination in the residential areas of the property (i.e., in yards around houses), nor the presence of contaminated drinking water at these homes. Furthermore, there is a distance of nearly 1000 feet between the residential areas of the property and the areas used for waste disposal. Because the site should be defined as those areas containing wastes or contaminants, it is arbitrary and unsupported by the facts to conclude that there is residential use of the site.

The possible impairment of several private water supplies was raised in the May 20, 1992 public hearing as a community concern even though USEPA concluded that drinking water supplies or resources were not endangered by the site.

> *"In summary, essentially no impact to area residential wells was observed in the samples collected." (pg. 80)* and *"The results of the Phase II Remedial Investigation indicate that there is limited potential for significant off-site migration of contaminants from the Skinner site." (pg. 103)*

Nevertheless, by connecting potentially affected residences to the available public drinking water supply, a prompt response to community concern can be provided. Together, these institutional controls can prevent or severely limit all current potential exposures and subsequent health risks related to media of concern (Table 1). These controls can be implemented immediately with only a minimum of financial resources.

4.5 Evaluation of the Appropriate Remedy

The remedy presented above should have been selected for the Skinner Landfill because it is more protective of human health than incineration (because it avoids the substantial potential short-term risks posed by excavation); meets chemical- and action-specific ARARs to the same degree as incineration; meets location-specific ARARs to a greater degree than incineration; is as effective in the long-term and as permanent as incineration; reduces contaminant mobility, toxicity, and volume through treatment of soil and groundwater (if necessary) to a greater degree than containment alone; is more effective in the short-term than incineration; is more readily implemented than incineration; is less costly than incineration and no more costly than containment only; and (based on comments made during the May 20, 1992 and July 29, 1992 public meetings) is likely to have greater public acceptance than incineration.

TABLE 1

SUMMARY OF POTENTIAL EXPOSURE PATHWAYS FOR SKINNER LANDFILL SITE AFTER IMPLEMENTING INSTITUTIONAL CONTROLS

Exposure Route, Medium and Exposure Point	Residential Scenarios		Occupational Scenarios		Recreational Scenarios	
	Pathway Selected	Justification	Pathway Selected	Justification	Pathway Selected	Justification
Soil Ingestion/Dermal Contact						
Future Use	No	Fence/deed restrictions	Yes	Workers on site	Yes/No	Fence: very limited exposure if any
Inhalation of Vapors/Particulates						
Future Use	No	Contaminated soils deep. Fence/deed restrictions	No	Contaminated soils deep	No	Contaminated soils deep. Fence/deed restrictions
Groundwater Ingestion						
Future Use	No	Public water supply	No	Public water supply	No	Public water supply
Groundwater Household Use						
Future Use	No	Public water supply	No	Public water supply	No	Public water supply
Surface Water and Sediment Ingestion and Dermal Contact						
Future Use	No	Exposures recreational in nature	Yes	On site creeks and ponds	Yes/No	Fence: very limited exposure if any
Ingestion of Contaminated Food						
Future Use	No	Deed restricitons	No	Deed restricitons	No	Fence, nature of area

5.0 CONCLUSIONS

Technical evaluation of the USEPA's Proposed Plan, the Phase I and Phase II Remedial Investigation Reports, the Baseline Risk Assessment, and the Feasibility Study shows that the existing documents are not adequate to support the selection of an incineration alternative. These documents did not appropriately consider the significant difficulties of implementing an incineration alternative, nor did they appropriately consider all of the potential risks associated with incineration alternatives. The risk evaluation of these alternatives presented in the USEPA documents is cursory and does not include several significant pathways and impacts caused by excavation of buried wastes.

USEPA's data on the extent of contamination emanating from the buried lagoon materials shows that the **actual** migration of contaminants is limited to the immediate vicinity of the buried lagoon, even after more than 15 years of uncontrolled infiltration of precipitation through the potential source materials without any engineered controls to limit migration. After correcting for several errors, the peak risks presented by the existing site conditions are found to be two orders of magnitude lower than those calculated by USEPA, and only slightly higher than the upper limit of the "acceptable risk" range. The remaining existing risks are further reduced by the elimination of pathways that accompanies fencing, deed restrictions, and the extension of public water supplies.

An appropriate remedy (which combines features of several USEPA alternatives) would consist of the following elements: 1) a cap over the buried lagoon and active landfill areas; 2) soil vapor extraction beneath the buried lagoon, if feasible; 3) groundwater collection and treatment at the downgradient side of the potential source areas, if necessary; and 4) institutional controls (fencing, deed restrictions, and extension of public water supply).

With the implementation of a capping alternative, the need for upgradient groundwater diversion is eliminated. The buried lagoon materials are located above the water table, and groundwater levels will further decline with time as recharge is diverted by the cap. In addition, the need for groundwater collection and treatment has not been established. With recharge through the waste materials substantially eliminated, there is no mechanism for impacting the groundwater, and any groundwater that may already be affected will purge itself with time.

The appropriate remedy should have been selected for the Skinner Landfill because it is more protective of human health than incineration (because it avoids the substantial potential risks posed by excavation); meets chemical- and action-specific ARARs to the same degree as incineration; meets location-specific ARARs to a greater degree than incineration; is as effective in the long-term and as permanent as incineration; reduces contaminant mobility, toxicity, and volume through treatment of soil and groundwater (if necessary) to a greater degree than containment alone; is more effective in the short-term than incineration; is more readily implemented than incineration; is less costly than incineration and no more costly than containment only; and (based on comments made during the May 20, 1992 and July 29, 1992 public meetings) is likely to have greater public acceptance than incineration.

Appendix A

Critiques of Technical Reports

CRITIQUE OF SKINNER LANDFILL
REMEDIAL INVESTIGATION REPORT

1. Topographic changes at the site between the initiation of RI and its completion (as documented in the different topographic maps in the Phase I and Phase II RI reports) occurred because the site owner was allowed to place additional demolition, construction, and landscaping debris and other fill materials over the buried lagoon and on the "active landfill" *during* the RI.

   The extra material over the buried lagoon caused extra drilling and related costs to be incurred during the Phase II RI. In addition, in its selected alternative, USEPA estimated that $1.3 million would be incurred during the remedial action for moving the debris material overlying the buried lagoon. Neither of these costs would have to be incurred if the Agency had appropriately controlled the owner's activities at the site.

2. The methods used for characterization of the buried waste lagoon were not appropriately chosen based on accepted scientific and engineering practice:

   2.1 The location of the buried lagoon determined "from aerial photographs" as shown on Fig 2.4, 5.6 of the Phase II RI report is incorrect as clearly shown by other data obtained during study.

   2.2 The large spatial extent and allegedly high concentrations of contamination beneath the buried waste lagoon are largely based on soil gas readings which may not correspond to concentration of contaminants adsorbed to immediately adjacent soils.

   2.3 Furthermore, it is not accepted scientific and engineering practice to use vapor readings from an OVA, an OVM and an HNu interchangeably because they are designed to detect different materials. The OVA senses methane and the HNu senses hydrogen sulfide, but not vice versa.

   2.4 Because an OVA was used for some of the readings, methane, rather than a solvent, could be the reason for some of the high OVA readings.

   2.5 Because of its original nature, the former lagoon ought to behave as a somewhat homogeneous source over its former extent. Any impact actually caused by the lagoon ought to have a spatial pattern consistent with the distribution of contaminants in the source and subsequent migration. However, no effort has been made to contour the spatial distribution of specific contaminants either in the buried lagoon soils or in "down-migration" media. Thus, any conclusions about whether the buried lagoon is actually the source of contamination found at another location on the site are speculative.

   2.6 Waste borings in the lagoon area (WL series) that did not hit "sticky" or "tarry" materials have sampling interval gaps at the depths where this material should have been encountered. Thus, it is possible that sticky and tarry materials are present throughout the extent of the former lagoon. Given the described nature of the "sticky" and "tarry" materials -- which remained on the augers even after the reverse rotation procedure used for abandonment -- it is very likely that they were carried down with the augers during advancement of the boring, potentially affecting subsequent vapor readings in soil samples.

3. The EPA has not properly characterized the site geology. The characterization of subsurface soil conditions is superficial and contains several errors:

    3.1 The descriptions of how the glacial soils were deposited and the resulting soil stratigraphy are simplistic, and may have led to inappropriate correlations between borings.

    3.2 The soil materials could have been better characterized (depositionally and in terms of permeability) and better correlated between borings if some grain size analyses had been performed.

    3.3 There are numerous instances where the geologic cross sections are inconsistent with each other, showing different soil materials at the same boring location (WL-05, WL-06, WL-08, WL-09, WL-10, WL-14).

    3.4 The geologic cross sections are also inconsistent with the top of bedrock map. The map shows a ridge between GW-20 and GW-28, but section B-B' shows a flat surface.

    3.5 In addition, the sections are described as "attempts" at correlation; as such, it is inappropriate to rely upon them to predict or characterize possible contaminant migration.

4. The EPA has not properly characterized the site hydrogeology or substantiated any claims that waste constituents are migrating away from the buried lagoon or landfill. Groundwater flow and contamination migration conditions are poorly and inconsistently characterized:

    4.1 The report takes moderately high permeabilities determined from slug tests and combines them with high apparent water table gradients to calculate rather rapid groundwater flow rates. However, the presence of high gradients in a groundwater flow system is most often an indication that the permeabilities are low. The combined result is low flow rates, not high flow rates as calculated in the report.

    4.2 In addition, if the groundwater flow rates were actually as high as those calculated in the report, there should be a broad area between the lagoon and the creek with significant impacts to groundwater, which there is not -- only the wells nearly adjacent to the lagoon show substantial impact. Thus, the absence of high flow rates is supported by the limited extent of impacts to groundwater.

4.3 EPA has not demonstrated that the "migrated" contaminants come from the alleged source. If a contaminant found in the groundwater has not been identified in the soils at the buried lagoon, a conclusion that its presence was caused by the wastes is arbitrary and unsupported by the evidence. Similarly, if the pesticides in GW-09 are from the lagoon, they should also be in GW-20 or GW-27, which are between the lagoon and GW-09 along the path of groundwater flow.

4.4 EPA has not demonstrated that the BETX components originate in the buried lagoon. Occurrences of BETX components as the sole contaminants in groundwater (or soil) could be due to spilled fuel from heavy equipment used in on-site landfilling operations and have nothing to do with the former hazardous waste disposal activities near the buried lagoon.

4.5 The only complete pathway at the site along which contaminants from the lagoon may move to an exposure point is via groundwater and its discharge to Mill Creek. However, based on the information presented in the Phase II RI report, the EPA has not demonstrated the need for a remedial action for site groundwater. In fact, the conclusions that summarize the existing on-site groundwater contamination presented in the Phase II RI report describe a very limited potential for off-site migration of contaminants via groundwater.

4.6 The only complete pathway of exposure from buried lagoon wastes is infiltration of precipitation, contamination of groundwater, and migration of groundwater to surface water. It is arbitrary and unsupported by the evidence to assume that exposures at any point along this pathway will be at the concentrations found at wells B-5 or GW-20, which are near the buried lagoon. In fact, current site conditions show very clearly that substantial attenuation is occurring as groundwater migrates toward Mill Creek. For example, analysis of leachate seeps LS-01 and LS-02, which are positioned between these wells and the creek, may represent what is actually migrating via this pathway.

5. There are numerous errors and inconsistencies concerning how the analytical data were handled in the RI and subsequently used in the risk assessment:

5.1 There were differences in validation methodology between Phase I and Phase II. Phase I used data only if it exceeded five times the concentration found in a related blank whereas Phase II used a screening factor of ten times. There is no discussion in the RI of how these differences were resolved when preparing the data summaries for the risk assessment.

5.2 In both Phase I and Phase II reports, numerous instances of problems with "introduced" contaminants are acknowledged, but there is no clear trail showing how these problems were handled in the RI summary tables or in the risk assessment.

5.3 There is no "data validation report" in the Phase II RI report, showing in detail how and why data were declared invalid.

5.4 In the Phase II RI, there were several instances where "valid" data showed the presence of contaminants in surface water or sediment that were subsequently determined not to be attributable to the site. It is not clear from the RI report how or whether this data was used in the risk assessment.

5.5 The groundwater contaminants reported from the Technical Assistance Team sampling comprise a significantly different suite of compounds than any other sampling event, and at concentrations significantly higher than any other sampling event. It is not clear 1) if these data were collected using accepted or approved procedure, or 2) how or whether these data were used in the risk assessment. At a minimum, such use would be very questionable based on the inability to clearly define where these samples were collected.

5.6 Comparison of four rounds of groundwater data showed only 9 of 156 compounds consistently reported at specific sampling locations. If a contaminant can not be consistently found, it is arbitrary and unsupported by the evidence to conclude that it is present at the site, or to conclude that it is a chemical of concern for the Baseline Risk Assessment.

5.7 In addition, it is not clear from the RI report how "single time" data were used in risk assessment. It is not appropriate to use a high concentration value from a single, inconsistent occurrence to determine risk in a way that assumes long-term exposure to that concentration.

CRITIQUE OF SKINNER LANDFILL BASELINE RISK ASSESSMENT

1. The Baseline Risk Assessment was unfocused and is of questionable quality because it was not conducted in accordance with applicable Agency guidance, and did not conform to accepted scientific and engineering practice.

    1.1 The selection of chemicals of concern (COC) was incomplete because the mobility and fate, and concentration versus toxicity characteristics were ignored. In addition, the large number of COCs obscures the predominant risks by creating long lists and multi-page tables which must be managed during the risk assessment and evaluated by those trying to use the report.

    1.2 The exposure assessment was flawed because all of the exposure pathways were considered to be complete, despite areas in the text which acknowledged that some of the assumed exposures are *unrealistic*.

    1.3 The toxicity assessment portion of the risk assessment was essentially nonexistent. There was no discussion of target organ toxicity for each COC or of confidence in the toxicity factors utilized in the risk assessment.

    1.4 The Baseline Risk Assessment was inconsistent with the U.S. EPA's Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual, Part A - EPA, 1989, because there were no toxicity profiles as required.

    1.5 The risk characterization only partially discussed potential health risks. No true characterization of potential site risks was attempted since toxicity profiles were not used.

    1.6 The derivation of the toxicity factors used in the risk assessments were not provided, resulting in potential risk estimates which can not be viewed with any degree of certainty.

2. The methods used in the Identification of Chemicals of Potential Concern (Section 2.0) were incomplete and often inappropriate.

    2.1 Much of the data from Phase I investigations were ignored because the detection limits were not reported in the formal Phase I RI report. Ignoring these data, instead of retrieving the data from the laboratories' files and using one-half the sample quantitation limit for these non-detected values (as per the U.S. EPA guidance - EPA, 1989) results in overestimates of chemical concentrations and, therefore, potential site risks.

    2.2 The Phase I data tables did not report the results from "blank" samples. Therefore, outside contamination may have been responsible for any of the detected chemicals and chemical concentrations.

2.3 For the selection of COCs in groundwater, the data were inappropriately split into bedrock and unconsolidated wells. The Phase I bedrock data had no background samples while the Phase II data had only one background sample. Also, no background residential well data were available. Therefore, the background concentrations of potential COCs were not well characterized - potential seasonal fluctuations were also ignored.

2.4 The Baseline Risk Assessment was inconsistent with U.S. EPA's Assessment Guidance for Superfund, 1989, as a concentration versus toxicity screening was not performed to further reduce the number of COCs to a reasonable number. This method provides a manageable list of COCs which defines 99% of the site risks and prevents any distraction from predominant risks caused by the inclusion of a large number of COCs.

2.5 The Baseline Risk Assessment was inconsistent with U.S. EPA's Risk Assessment Guidance for Superfund, 1989, as the selection of COCs did not consider the mobility, persistence, and fate of individual chemicals. Therefore chemicals which may not be available for human contact may have been included in the risk assessment, and vice versa.

2.6 Although the frequency of detection was considered to be a major criteria for inclusion/exclusion of chemicals from the risk assessment, a large number of chemicals were included even though they were only detected in one or two samples. Therefore, their inclusion is questionable, and may *result in exaggerated and unrealistic conclusions regarding potential site* risks.

2.7 "Professional judgment" was often used to include a chemical in the risk assessment. Without any discussion concerning the chemicals toxicity (i.e., toxicity profiles) this method of COC selection is inappropriate.

3. The Exposure Scenarios and Exposure Point Concentration assumptions (Sections 3.1-3.5) were often unrealistic and inappropriate.

3.1 The EPA incorrectly assumed that all areas of the site will be developed for residential use in the future.

3.1.1 The presence of a formerly active landfill on the site, the public knowledge of site use, and the State's statutory prohibition of excavating such an area makes this is an unrealistic assumption (Ohio Rev. Code Sec. 3734.02(H).

3.1.2 It is stated on Page 42 that it is unlikely that the waste lagoon area will be used for residential purposes in the future since it is a formerly active landfill. Therefore, it is unrealistic to assume future residential use of this area (Page 50), particularly since digging in a landfill area is prohibited by State law.

3.1.3 The report states that it was assumed that no drinking water wells will be installed in the waste lagoon area in the future (Page 50). *This is appropriate since it is a landfill, and since building in a* landfill area is prohibited by State law. However, it is *inconsistent* with the assumption that this area will be used in the future for residential purposes.

3.2 The risk assessment only evaluated the reasonable maximally exposed individual (RME). In keeping with current EPA guidance (February 26, 1992 memo from F. Henry Habicht II, Deputy Administrator, Office of the Administrator to Assistant/Regional Administrators - Habicht, 1992) a mid-range risk assessment (average or median) should also be conducted in order to fully characterize the range of individual risks at Superfund sites.

3.3 In evaluating whether the air exposure pathway is complete, the text (Page 50) states that the soils of concern are at depths where volatilization will not likely occur and vegetation/ground cover precludes the generation of fugitive dust aerosols. These statements indicate that the pathway is incomplete and should not have been further discussed in the risk assessment since there is no available source or chemical release from a source (EPA, 1989).

3.4 The current and future food exposure pathway is incomplete and should not be considered in the risk assessment for the following reasons:

3.4.1 There are no vegetable gardens or agricultural areas on the site. Institutional controls would preclude these uses in the future.

3.4.2 The close proximity of the site to a school, day care, and residential areas indicate that hunting is unlikely to occur on the site.

3.4.3 No sport fish which are normally consumed were identified in site surface water bodies.

3.5 The groundwater exposure pathway does not provide a reasonable estimate of potential site risks. Page 53 states that the maximum detected concentration was used as the exposure point concentration used to evaluate groundwater exposures. This provides a "bounding estimate of risk" or "worst-case scenario" which along with other exposure assumptions produces the highest conceivable risk. As pointed out by the EPA, "the probability of an individual receiving this combination of events and conditions is usually small, and often so small that such a combination will not occur in a particular, actual population"(Habicht, 1992).

3.6 Current residential exposure to soils used an inappropriate exposure point concentration. The current on-site residences are located a great distance from the impacted soils. The exposure point concentration for this scenario should use only soils in the immediate vicinity of, or on, the residences. Exposures to any other site soil would be more of a recreational type (nonresidential) of exposure which would occur with significantly lower exposure frequency, etc.

3.7 The report does not indicate which soils data were used for current occupational exposure scenarios (Page 54).

3.8 The report states that two soil exposure point concentrations were used for future waste lagoon land use scenarios (i.e., residential and nonresidential). However, Table 3-5 only provides one future exposure point concentration.

3.9 The future residential use scenarios of the buried lagoon utilized all soils data from this area. Even if excavation of deeper soils were to occur under future residential use conditions, soils greater than approximately 10-15 feet deep would not be excavated under normal construction activities. Therefore, the deeper, more contaminated soils (located at depths greater than 20 feet) would not be brought to the surface to provide an exposure point.

3.10 The risk assessment was inconsistent when evaluating surface water and sediments.

3.10.1 Future surface water concentrations were estimated for Mill Creek, but not the other surface water bodies.

3.10.2 Future sediment concentrations were not estimated. If surface water is assumed to change over time, then sediments may also be altered.

3.11 The risk assessment data did not differentiate between the valence states of chromium. Therefore, all detected total chromium was assumed to be the more toxic hexavalent form. This assumption could lead to an extremely overestimated risk for chromium in soils. There should have been an attempt to differentiate between trivalent and hexavalent chromium.

4. The Estimation of Chemical Intakes (Section 3.6) often utilized inappropriate assumptions, thereby leading to erroneous estimations of intake and subsequent health risks.

4.1 The risk assessment states that it is utilizing the EPA default of a 30 year total residential and recreational exposure duration. The risk assessment should, therefore, have used an exposure duration (and a noncarcinogenic averaging time) of 6 years for the child and 24 years for the adult (total of 30 years).

4.2 In spite of the fact that the report states that EPA default values were utilized, estimates of the occupational exposure intakes were based on an exposure duration of 47 years, not the EPA default of 25 years (U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: Standard

Default Exposure Factors, 1991 - EPA, 1991). This would also affect the *noncarcinogenic averaging time.*

4.3 The Baseline Risk Assessment is not consistent with EPA guidance (1991) for exposure frequency. The risk assessment assumed an exposure frequency of 365 days/year for residential soil and groundwater exposure intake estimates. Since people normally spend approximately two weeks away from home each year, the EPA has established a default exposure frequency for residential exposures to 350 days/year.

4.4 The skin to soil adherence factor was assumed to be 2.11 mg/cm^2. This assumption appears to be overly conservative since the EPA (1989) indicates that the factor is 1.45 mg/cm^2 for commercial potting soil, and was found to be 0.51 mg/cm^2 in a study of 2-6 year old children during the summer in Hartford, Connecticut (Lepow et al., Envision. Res. 7:99-102, 1974; Lepow et al., Envision. Res. 10:415-426, 1975).

4.5 Estimated exposure intakes of COCs in surface water and sediment were based on swimming exposures. This recreational exposure appears to be realistic for the ponds evaluated. However, "wading" appears to be the only realistic recreational activity for the relatively shallow creeks/brooks/intermittent streams evaluated in the risk assessment. This would dramatically affect the exposure duration, exposure time, exposure frequency, skin surface area, etc.

4.6 The Toxicity Assessment section (Section 4.0) of the risk assessment is totally inappropriate for fully characterizing potential health risks. The absence of toxicity profiles precludes a true characterization of potential risks for a number of reasons.

4.7 The appropriateness of the use of toxicity factors contained in the Health Effects Assessment Summary Tables (HEAST) can not be determined. HEAST data are not peer reviewed and may be incorrect or inappropriate. As pointed out by the EPA in the "Caution" statement in each edition of HEAST, the HEAST data "alone tell very little about the adverse effects of a chemical or the quality of evidence on which risk assessments are based". "The HEAST is structured to point the user to" the original source documents for a more complete characterization of risk.

4.8 Uncertainties and levels of confidence in the toxicity factors are not discussed, potentially exaggerating risks. An example would be the current scientific thinking that the carcinogenic potency of dioxins may be up to 100 times lower than the EPA slope factor. The EPA is currently reviewing the cancer risk assessment for dioxins.

4.9 Certain compounds effect specific organs in the body. Without knowledge of each chemical's target organ toxicity and toxicodynamics, assuming additivity for carcinogenic and noncarcinogenic effects can not be performed with any scientific basis. Nevertheless, the carcinogenic and noncarcinogenic effects for all chemicals of concern were added together in the Baseline Risk Assessment.

4.10 Toxicity factors derived by U.S. EPA's contractor can not be verified without a discussion of each chemical's toxicity characteristics. These derivations often produced unacceptable noncarcinogenic toxicity factors (reference dose - RfD) as pointed out by the ECAO. The use of unacceptable numbers is not better than no number at all since they may result in misleading risk characterization.

4.11 The authors often attempted to derive a RfD based on an acute LD_{50} value. This is totally inappropriate since:

4.11.1 The LD_{50} end-point is a fatality, not the on-set of cancer or illness.

4.11.2 The time required to achieve the LD_{50} end-point is largely unknown because it may have occurred at any point between 1 minute to 14 days postexposure.

4.11.3 The minimum database for derivation of a chronic RfD is a single, well documented study (EPA, 1989).

4.11.4 An uncertainty factor of 1,000,000 was often applied despite EPA guidance that an uncertainty factor of greater than 10,000 should never be used.

5. The improprieties in the first three phases of the risks assessment resulted in a Risk Characterization section (Section 5.0) which was incomplete and inaccurate as further outlined below.

5.1 The evaluation of potential cancer risks for children provides little insight into significant site risks. Since cancer is a lifetime risk, it would be more appropriate to evaluate potential risks to children and adults *combined,* using a total exposure duration of 30 years as discussed previously.

5.2 Residential exposures to buried lagoon soils will not likely occur, therefore, these risks should not even be expressed. The area is a formerly active landfill, the contaminated soils are largely at depths greater than 23 feet, and the potential presence of explosives makes excavation of these soils unlikely.

5.3 The inappropriateness of the exposure point assumptions for soils results in future residential risks which are less than current residential risks (refer to previous comments concerning residential exposures). Without modeling to account for natural degradation of chemicals in soil, this finding is not appropriate.

5.4 The uncertainties concerning the toxicity of dioxins should be discussed in order to fully characterize risks to soil.

5.5 The report states that in order to add noncarcinogenic risks for individual chemicals (hazard quotients), the compound must produce the same toxic effect by the same mechanism of action. Despite this statement and the absence of toxicity profiles, the report proceeds to sum the noncarcinogenic risks for all the COCs regardless of this constraint.

5.6 The swimming scenarios for Mill Creek and Skinner Creek are inappropriate. As discussed previously, wading activities would provide a more *reasonable* estimate of potential risks.

5.7 The current and future residential multiple exposure pathways total risks in Tables 5-45 and 5-46 are combining residential exposures via the buried lagoon *and* site-wide soils (along with other pathways). It is inappropriate to combine these 2 residential exposures since an individual can only reside in one area, not both. Exposure to solids in other areas of the site would be recreational in nature, not residential.

5.8 The uncertainties discussion does not mention the complete absence of toxicity profiles, the levels of confidence in toxicity factors, the data from which the toxicity factors were obtained, etc.

CRITIQUE OF SKINNER LANDFILL FEASIBILITY STUDY

1. The EPA has not demonstrated that the proposed remedial plan is consistent with the limited migration of contaminants and the relatively minor potential public health and environmental risks posed by the site. The remedial alternatives and the preferred remedy are extremely conservative and very much "overkill" considering the relatively minor public health and environmental risks posed by the site. Further, with the limited potential for migration of site derived chemicals, it appears that in situ methods and containment technologies should be emphasized.

2. The stated remedial objectives presented in Section 3.2 for each environmental media are extreme. This has skewed the evaluation and screening process away from a number of processes and technologies which are known to be effective. Section 3.4.2.1 incorrectly concludes that incineration is the only viable technology for effectively managing contaminated soils, and fails to evaluate the application of several technologies in combination with one another in order to achieve remedial objectives.

3. The ARARs and resultant remedial objectives are based upon the questionable, and in some cases unsubstantiated findings of the Remedial Investigation Report and Baseline Risk Assessment.

   A more reasonable view of the RI data, and a more reasonable assumption regarding the future use of the site, will yield a more realistic picture of the true public health and environmental risk associated with the site. The remedial objectives should be based accordingly.

4. In situ soil treatment technologies are rejected (Section 3.4.2.3) since "not <u>all</u> soil contaminants would be removed or immobilized" (emphases added). It is not necessary to remove all contaminants to effect an appropriate level of risk reduction.

5. The EPA's data to date does not demonstrate that groundwater collection/treatment is necessary. A more reasonable approach would be to cap the site while carefully monitoring groundwater and completing the RI database (see RI comments).

   Once the true impact to groundwater is known and the effectiveness of an impermeable landfill cover evaluated, the need for further groundwater collection/treatment could be considered.

6. The upgradient slurry wall is not necessary given the stated permeabilities. The affect of consolidating and capping the fill on groundwater quality should be evaluated. Placement of an impermeable cap would obviate the need for groundwater collection and treatment. Capping the site would likely eliminate any groundwater mound under the waste mass.

7. The remedial objectives presented in Section 3.2 are based upon risk reduction levels which assume future site use as residential. Obviously the site will never be used for such purposes and therefore the alternatives developed far exceed what is

necessary or appropriate. Institutional controls can be used to further restrict future land use at the site.

Risk reduction levels and remedial objectives should be based upon the true environmental and public health objectives. As such, institutional controls in conjunction with containment will result in acceptable reduction of risk and avoid the numerous risks and general nuisance conditions posed by excavation and incineration.

8. Section 3.2 identifies the remedial objectives for each environmental media. The stated objectives for groundwater, surface water and surface water sediments can all be attained by containment alternatives. *The stated objectives for soil reference* the USEPA guidance document "Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites" (USEPA February 1991) and the *preference for developing remedies which permanently and significantly* reduce the volume, toxicity, or mobility of hazardous substances of wastes, and concludes that incineration is appropriate. However, the guidance document acknowledges, where wastes are not readily accessible or where excavation would be difficult or risky, that engineering controls and containment alternatives which provide acceptable reduction of health and environmental risks are acceptable.

9. Five alternatives were evaluated under the FS, four action alternatives and one no action alternative. According to USEPA's own evaluation, each of the four action alternatives will achieve the stated remedial objectives and provide an adequate reduction of the existing risk presented by the site (see Section 4.1).

   According to the Feasibility Study, Alternative 2 (incineration) and Alternative 5 (incineration plus vapor extraction) cost $28,700,000 and $29,000,000 respectively. Similarly, Alternatives 3 and 4, both of which recommended encapsulation, cost $15,500,000 and $14,800,000 respectively. As such the selected remedy (Alternative 5) is twice as expensive (using USEPA's calculations) as the encapsulation alternatives (Alternatives 3 and 4) with no commensurate reduction of risk or protection to the environment. USEPA has not demonstrated that the incremental cost of the selected remedy over the encapsulation alternatives is justifiable. Additionally, USEPA has failed to adequately address the risks associated with excavation of the wastes.

10. Except for the use of soil vapor extraction, Alternatives 2 and 5 are identical. Except for very minor differences in the cover system design, Alternatives 3 and 4 are identical. The Feasibility Study did not follow applicable guidance because it developed what amount to only two alternatives instead of a wide array of potential alternatives.

    As FS evaluation should consider a range of different alternatives to provide a range of environmental benefit, costs, implementability and effectiveness. This FS fails to provide a range, and the selection process defaults to the most costly option even though alternatives meeting the remedial objectives with fewer risks posed during construction, costing half as much, that could be implemented significantly faster, with a greater ease of implementation are passed over.

11. The field investigations to date lack much of the detail required to properly assess and evaluate the applicability of incineration technologies and to adequately evaluate construction and operating costs.

12. Alternative 2 and 5 include the excavation and handling of currently buried waste, including an unknown quantity of explosive wastes. The potential risks to workers, public health and the environment have not been evaluated. The presence of any explosive wastes will strongly support in-place containment as the preferred option.

13. Alternative 2 and 5 involve incineration which will require on-site test burns and the application for an air emissions control devise permit. As such the implementation of Alternative 2 or 5 will be significantly more difficult and time consuming than implementation of Alternative 3 or 4. Alternatives 2 and 5 may realistically take 5 years or longer to implement than Alternatives 3 and 4.

14. Under Alternative 2 and 5, the volume of soil requiring excavation and incineration has been estimated based upon minimal data. The actual quantity requiring incineration under these alternatives could be significantly greater.

15. Under Alternative 2 and 5 a significant quantity of demolition debris presently overlying buried waste layer will need to be removed and managed. It would be more appropriate and cost-effective to cap the material in place.

16. Alternatives 3 and 4 involve in-place containment through the installation of a multi-layered final cover system. Due to existing site topography a concrete retaining wall is proposed for a portion of the cover. A significant quantity of fill will also need to be imported to the site to prepare the landfill for placement of the final cover. The cost estimates for Alternative 3 and 4 do not fully address these issues.

17. The details provided regarding each of the alternatives, including limits of the cover system, specifics of the groundwater collection and treatment system, depth of excavation, extent of the concrete retaining wall, etc. are not sufficient for determining constructability nor for evaluating costs. The encapsulation cell design should be presented by several cross sectional views to determine fill and grading requirements.

18. Detailed cost estimates presented in Appendix IX raise additional questions.

    18.1 Slurry wall costs for northern and southern walls are based on assumed depths of 15 feet and 10 feet respectively. Additional borings are needed during the design phase to confirm the depth and proposed routes, and cost estimates revised accordingly.

    18.2 Similarly, the proposed interceptor trench is assumed to be 17 feet deep. Depth and location need to be confirmed during design phase. The cost of supplemental investigations should be included.

    18.3 Equipment proposed for the groundwater treatment system are excessive - (i.e. why glass lined storage tanks?). Additionally the costs for performing a treatability study should be included.

    18.4 Treatment building costs approximate $60/sf which are well in excess of the costs typical of a warehouse building.

18.5 Buried lagoon excavation costs do not include the off site management and disposal of soils which can not be incinerated.

18.6 Buried lagoon excavation costs present a construction dewatering system, however, the costs do not appear to address the cost for treating the collected water.

18.7 Installation of the slurry wall, interceptor trench and excavation of the buried lagoon require level B health and safety protection for certain phases of the work. Providing this level of protection is costly and can be avoided if the containment option is pursued.

18.8 The concrete retaining wall cost of $946,800 included in the multi media cap estimate may be underestimated. This wall will need to be designed with appropriate anchors and foundation to support the waste fill loads behind the wall. The wall may also require an impervious liner. These costs can be avoided by simply regrading the site and capping.

18.9 Incineration costs do not appear to include the cost of permitting.

19. Appendix II provides soil remedial action levels based on criteria generated to protect groundwater quality. These calculations did not consider any attenuation or dilution factor(s) of groundwater. Therefore, these criteria may be orders of magnitude too restrictive.

20. Since institutional controls and State law will preclude residential uses of the site, it may be more appropriate to establish soil remediation action levels which are protective of human health based on ingestion and direct contact of soil via occupational or recreational scenarios.

21. Appendix VII ignores potential health risks during excavation of soils, due to the presence of explosives on the site. It is arbitrary and capricious and inconsistent with the NCP and USEPA's guidance documents to recommend excavation when all risks associated with excavation were not evaluated as required. The USEPA must leave the soils in place or it unnecessarily completes an exposure pathway and <u>increases</u> the risks to the community and site workers by excavation.

Appendix B

Revised Cost Estimate

APPENDIX B
REVISED COST ESTIMATE
USEPA'S PREFERRED ALTERNATIVE

Remedial Element	Cost
Alternate Water Supply	$89,900
Institutional Action/Site Work	$260,800
Northern Slurry Wall and Groundwater Diversion	$593,500
Southern Slurry Wall	$385,000
Interceptor Trench	$987,100
Groundwater Treatment System	$282,200
Vacuum Extraction System	$455,800
Incineration	$16,661,200
Multi-Media (Subtitle C) Cap	$11,903,700
Waste Lagoon Excavation	$8,984,500
Construction Subtotal	**$40,603,700**
Engineering (7%)	2,842,300
Construction Management (10%)	4,060,400
Contingencies (20%)	$8,120,700
Construction Total	**$55,627,100**
General Operation & Maintenance (Present Worth) (Interceptor Trench, Groundwater Treatment, and Cap Maintenance; GW/SW Monitoring)	8,597,700
Incinerator Operation	24,144,400
Vapor Extraction Operation	$131,800
Operation & Maintenance Total	**$32,873,900**
TOTAL COST OF REMEDIAL ALTERNATIVE	**$88,501,000**